READY FOR ACTION! COMBAT PARK FLYERS

MODEL Airplane NEWS

Mustang Roundup

67 FIGHTERS & RACERS
page 28

MRC/ALTECH
EZ DAGO RED

CUSTOM-BUILD
Spoked wheels

LOW-COST PLANE/HELI RADIO
JR's new XP662

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rogram!
age 88

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MODEL Airplane NEWS

OCTOBER 2002 VOLUME 130, NUMBER 10

ON THE COVER: *the clean lines and historic significance of the Mustang make it one of the most appealing aircraft around; no wonder it's an all-American classic. This EZ Dago Red ARF from MRC is featured in a "Flight Test" on page 52; for a complete survey of P-51s, see our "Mustang Mania!" article on page 28 (photo by Walter Sidas).*

FEATURES

FLIGHT TESTS

CONSTRUCTION

COLUMNS

DEPARTMENTS

Mustang Mania!

North American's P-51 Mustang arguably holds the most significant place in American aviation history. Not only did these aircraft contribute to turning the tide of WW II in favor of the Allies, but with their sleek lines and personalized paint schemes, they also epitomized what it meant to be a "fighter." **Model P-51s** come in all sizes and with all types of power systems—from indoor flyers to sport-scale combat planes to giant-scale, museum-quality machines. In this issue, we've compiled data on more than 60 P-51s, including fighters, Reno Racers and Twin Mustang variants. Whether you're looking for a long building project or an easy-to-assemble ARF, a pure fighter or a souped-up racer, you'll find it here. For more information on the Mustang, check out our click trip at www.modelairplanenews.com; it features "**P-51 Mustang Action!**," a *Flight Journal* special issue.

This Fiberclassics kit, built by Bill Stevik and Dean DiGiorgio, placed first in Team Scale at the prestigious Top Gun Invitational (2001).

ON THE WORKBENCH

Also in this issue, Bertil Klintbom shares his method of making inexpensive, **light spoked wheels** for his models, and senior tech editor Gerry Yarrish describes a simple way to reposition carburetors so you can use straight throttle linkages on gas-powered models. Electrics enthusiasts will appreciate Greg Gimlick's review of the latest version of **MotoCalc**—a must-have computer program that helps you select the perfect equipment to power your plane. Rounding out this month's features is Bob Aberle's review of the new **JR XP662** programmable, 6-channel radio that works with airplanes *and* helicopters.

DOGFIGHT YOUR NEIGHBOR!

Ready for combat action? Check out assistant editor Matt Boyd's **"Backyard Flyer"** report on the new HobbyZone Fighterbird—a ready-to-fly model that features a sonic "zapper" weapon that can register hits during air-to-air sorties with other Fighterbirds. It's time to see who really rules the skies! See you at the field.

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WRITE TO US! We welcome your comments and suggestions. Letters should be addressed to "Airwaves," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA; email man@airage.com. Letters may be edited for clarity and brevity. We regret that, owing to the tremendous numbers of letters we receive, we cannot respond to every one.

GEAR PLACEMENT

I'm building an experimental model airplane and was wondering whether you know of a formula to help determine the correct placement of landing gear relative to the fuselage's length; for example, "If your airplane is X inches long, then the landing gear should be placed Y distance from the front," or something like that. Thanks for your help. [email]

JEREMY

First, I need to know whether you're building a tail-dragger or a nosewheel-equipped airplane. Obviously, there are some differences. If you are designing a tail-dragger, the gear should be positioned so that when the fuselage is placed in a level attitude, the main gear's axles are at or slightly forward of the wing's leading edge. Of course, this depends on various factors—not the least of which is the length of the nose moment.

For a nosewheel and main-gear (trike) setup, the main gear should be slightly aft of the model's center of gravity (CG), and the nose gear should be attached to the firewall. Again, it will take a bit of trial and error to get things just right. I recommend that you build your model so you can easily move the landing gear forward or aft. This way, you'll be able to perform taxi tests to determine the best gear position. Find the location that allows the model to rotate easily during takeoff yet not to nose over on landings.

Hope this helps you get in the ballpark. GY

HOT AND COLD

I read Dave Gierke's "Engine Questions and Answers" in the August 2002 issue of *Model Airplane News*, and I was confused by the question about hot and cold. Dave said to lean the mixture in hot weather, but won't this lead to overheating? We have had a heat wave here for the last 10 days, so I followed his suggestion and leaned the mixture. The engine promptly overheated and quit. To keep it cool, I had to richen the mixture; then the engine ran fine. This is the opposite of what I thought he said in his column. Did I misinterpret his remarks? [email]

MARV LUEBBERT

If you set the primary needle valve of any engine in the cool of the morning for peak rpm and then allowed the engine to sit until afternoon, when the temperature had risen 20 degrees, you would find that when you restarted the engine (without changing the needle-valve setting), it would run on the rich side of peak

rpm and would require leaning the needle to re-establish its peak. This is because the air has less oxygen density at the higher temperature. Therefore, to maintain the proper air/fuel ratio, the fuel would need to be reduced somewhat. In other words, I didn't intend to suggest leaning the needle valve beyond the engine's peak rpm point because the air temperature had increased but to bring the mixture into the correct proportions, which in this case requires leaning. Thanks for pointing out the problem with my original explanation!

DAVE GIERKE

SERVO CHOICES

In 1990, after a years-long hiatus, I again became hooked on modeling when I fell in love with the Goldberg Ultimate 10-300 bipe. I had never built an RC airplane before, but I went all-out with a 1.20 engine, a smoke system and many other additions including an onboard glow driver. (This is a labor of love.) Now, at age 71, I have completed the job, except for the painting and testing. (I won't fly it myself until I have had some training.)

In the December 1999 issue of *Model Airplane News*, I read an "Airwaves" letter from Bill Mathis that concerned servo strength. I'm now worried that I may have under-powered my ailerons. The plan called for one servo placed in the center of the lower wing to drive both the lower and upper ailerons using connecting pushrods. I did not feel that the Futaba FP-S148 servo was powerful enough, so I replaced it with a Futaba S9301 rated at 69.5 oz.-in. of torque. Is that enough? Also, instead of using the recommended wire pushrods, I installed flexible cables in tubes with about 1½ inches of solid wire soldered to each end. Have I possibly committed a fatal error? The elevators also run off a single S148 with a split pushrod to operate both elevator halves. I used a single S148 for the rudder, using pull/pull cables. I don't wish to perform surgery on this beauty, nor do I want it to crash when I learn to fly and get into aerobatic flight. Could you advise me?

SIDNEY ELKIN
Montreal, Canada

Sidney, it sounds as though you have a really nice Ultimate Bipe on your hands. It is good that you decided not to test-fly this model but have sought help from someone more experienced. Once you have learned to fly on a trainer, you'll really enjoy the Ultimate; it is a dream bipe to fly. Using one servo to operate all four ailerons will require extra strength, so the servo with 70 oz.-in. of torque is a better choice and should be strong enough. As long as the flexible cables and tubes are securely installed in the wing, you should not have a problem. Grab the ailerons by the trailing edge with the radio on and give them a wiggle. Is there any free play or slop in the system? If it is tight and wiggle-free, you'll be fine—especially if you intend only to sport-fly the model. For the elevator, I also recommend a servo with 70 oz.-in. of torque, and again, check the play in your control-linkage setup. If you're unsure, have an experienced friend check your installations for you.

Hope this helps put your mind at ease.

GY

AIR SCOOP

by the staff of Model Airplane News

NEW PRODUCTS OR PEOPLE hit the model airplane market all the time, so here's the inside source for what's hot and where you can get it. Every issue, we sift through product announcements, show reports, rumors and prototypes to let you in on the best and the latest. Remember, you saw it here first!

Who says electric is easier than glow?

HANGAR 9

ALPHA RTR WITH EVOLUTION TRAINER POWER SYSTEM

Every piece of this new Alpha ready-to-run trainer was developed specifically with the beginner in mind, including its Evolution Trainer Power System. It's test-run and tuned at the factory, so novices can get the Alpha into the air as quickly as if it were electric-powered. The Alpha comes out of the box completely assembled and covered with UltraCote. In addition to the Evolution Trainer Power System, all of the radio gear is installed. Assembly time on this 63-inch-wingspan trainer is a matter of minutes. The Alpha with Evolution Trainer Power System sells for $309.99, but because the power system is compatible with other trainers as well, it's available separately for just $79.99.

Hangar 9; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.

A Helping Hand from Hitec

Anyone who has purchased a Hitec product knows that the company cares about helping RC hobbyists financially. Hitec gear offers as much value per dollar as anybody's, and the quality is top-notch. For the second consecutive year, Hitec has stepped up to help entire RC clubs. In the interest of helping the hobby grow, the Hitec Field and Track Improvement Fund will award 10 RC clubs $1,000 each to help finance improvements to that club's facilities. Applicants must be from organized and established clubs and must write to Hitec with an outline of their proposed improvements, along with a brief statement of why their club should be awarded one of the prizes. To see the full list of entry rules, visit the Hitec website. Good luck to all you club members out there, and thanks to Hitec for making a meaningful commitment to improving the RC hobby.

While you're checking out the rules, notice Hitec's new logo; the design is new, but the value it represents is still the same.

Hitec RCD Inc. (858) 748-8440; hitecrcd.com.

HACKER

OSPREY & STAR

Splash-and-go with this 44-inch-span, almost-ready-to-cover Osprey X-28A seaplane. It comes with a coated, white fiberglass fuselage and engine pylon, balsa and ply wings and tail, a complete hardware package and decals. Just add a Speed 400 motor, 3-channel radio with two miniservos and ESC and head for the pond! Wingspan—43⅜ in.; weight—35 to 36 oz.; price—$169.99.

Modeled after a Czech airplane, the 4-channel TL96 Star model offers huge aerobatic potential in a 43-inch-span package. This ARF model features a lightweight, fiberglass fuselage, balsa wing and horizontal tail covered in Easycoat polyester, a clear molded canopy, complete hardware package and decal sheet. Wingspan—43⅛ in.; weight—14 to 18 oz.; power recommended—.061 to .09 2-stroke; 4 channels; price—$169.99.

Hacker; distributed by Sig Mfg. (641) 623-5154; sigmfg.com.

HERR ENGINEERING

1/2A Cessna 180 SKYWAGON

Return to the '60s with Herr's nostalgic Cessna 180 Skywagon. This gentle, easy-flying airplane has great low-speed performance and is sure to turn heads at the field.

The laser-cut, balsa and ply kit comes with a full-size plan, a complete hardware package, molded cowl, wing struts, clear windshield and illustrated instruction manual, and it retails for only $89.99. Wingspan—43.5 in.; weight—21 oz.; recommended power—.049 to .061 2-stroke; 3-channel radio with miniservos.

Herr Engineering; distributed by Sig Mfg. (641) 623-5154; sigmfg.com.

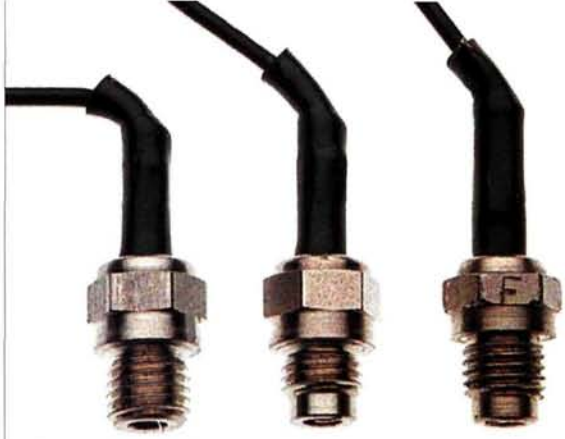
CARL GOLDBERG PRODUCTS

EX-TREME 330 3-D ARF

What do you do if you want giant-scale-level aerobatic performance, but you don't have a giant-scale wallet? You pick up a Carl Goldberg Ex-Treme 330 3-D ARF. This plane will do every maneuver the big boys do, and it costs just $129. The wingspan is 46.5 inches, and it has 744 square inches of area to carry the model's 3.5- to 4.5-pound flying weight. The airframe is all wood and comes completely covered. Performance is top priority, so features such as dual aileron servos and rear-mounted tail servos ensure crisp, precise control-surface movements at any throw angle. The plane doesn't skimp on features; a complete hardware package, aluminum gear, wheels and a fuel tank are all included. It requires a .32 to .46 2-stroke or a .40 to .63 4-stroke.

EXTREME AEROBATICS without the extreme price tag

Carl Goldberg Products (678) 450-0085; carlgoldbergproducts.com.



MCDANIEL RC

LOW-PROFILE GLOW-PLUG connectors

No one likes to make unnecessary holes in the cowl of a nice scale airplane. McDaniel has eliminated the need for one hole with its new, low-profile glow-plug connector. It's made of 20-gauge silver-plated copper wire that is Teflon-insulated so it won't melt if it touches the engine head. The connector has an adjustable crimp for a tight, nonslip fit. It's available in custom lengths and is ideal for multi-cylinder engines. Specify Fox, O.S., or standard plug stems when you order (sorry; Rossi and Enya plugs won't fit). At $6, there's no reason not to use them on all your cowled engines.

McDaniel R/C Electronics (573) 782-6689; mcdanielrc.com.

HOBBY LOBBY

FELINE WARBIRDS *large and small*

These two new cats from Hobby Lobby run the gamut for electric scale warbirds. No matter whether you like large planes or small, foamies or composite construction, singles or twins, one of these fabulous felines is bound to appeal to you. For you backyard fans, F6F Hellcat is a little Speed 400 park flyer that uses hollow molded-foam construction to produce a lightweight and nicely detailed scale look. It comes painted in a three-tone color scheme; all you have to do is apply the included water-slide decals. This 39-inch-span fighter is 4-channel and comes with a 4:1 gearbox, prop adapter, landing gear and wheels for $129.

It your tastes run more toward the larger breeds, check out this 52-inch Tigercat twin. The fuselage and nacelles are gelcoated fiberglass; the wing and tail sections are built-up balsa and almost ready to cover. The kit includes lots of scale details for dressing up the cockpit and engines. The plane is ideal for a pair of Hobby Lobby's AXI brushless motors, but standard motors will also work. The brushless units provide plenty of power, and 5- to 7-minute flights are possible with an 8-cell, 2400mAh Ni-Cd. Price: $259.

Hobby Lobby (615) 373-1444; hobby-lobby.com.

FMA DIRECT

Kokam Superior Lithium Polymer Batteries

Next-generation battery tech

Lithium-polymer cells are among the hottest new products on the market, representing the most significant advance in battery technology since the introduction of Ni-Cds. As the demand for these hot little cells continues to grow, so, too, does their availability. FMA Direct is proud to announce that it is now the exclusive agent for Kokam Superior Lithium Polymer Batteries, and FMA will soon stock all Kokam products. Available initially as bare cells, they will eventually come as assembled packs. Rumor has it that several types of chargers and a special ESC designed specifically for these packs will soon follow; we'll keep you posted.

FMA Direct (301) 668-7614; fmadirect.com.

LANIER RC

STINGER 60 ARF

Classic sport flyer now comes built

The Lanier Stinger 60 has long been a favorite among sport fliers; its all-around performance is popular with novices and experts alike. The only downside (at least, for those of us with busy schedules) was building time. Lucky for us, the Stinger now comes as an ARF, so everyone is free to enjoy its stellar flight characteristics. Underneath the expertly applied iron-on covering, it is the Stinger you know and love with its all-wood, built-up airframe and wing. The package includes a fiberglass cowl, wheel pants and full hardware. The wingspan is 60 inches, and it weighs 6.5 to 8 pounds, ready-to-fly. Bolt on your favorite .60 to .91 2- or 4-stroke, and you'll be airborne in no time. To top it off, the Stinger 60 ARF costs less then $200!

Lanier RC (770) 532-6401; lanierrc.com.

VENOM RACING

VENOM SYSTEMS CHECK

Visual checks are fine for some of your airplane's equipment, but a quick glance won't tell you much about the electronics in your RC system. That's where Venom Racing's System Check device can really save your tail (and the rest of your plane, too). Installation couldn't be simpler; just plug it inline with any servo—no extra wiring is required. From there, it can monitor switch harness, receiver crystal, filter and tuning-circuit problems as well as keep track of battery voltage with an LED indicator. The default setting for the voltage warning is 4.75 volts, but the level is adjustable with a pot. The unit is just $29.99—a real bargain when you consider the expensive repairs it can prevent.

Venom Racing (949) 650-6151; venom-racing.com.

Don't be bitten *by radio failure!*

AEROTECH MODELS

HUSKY CHALLENGER 2.7

More horses for your Mustang

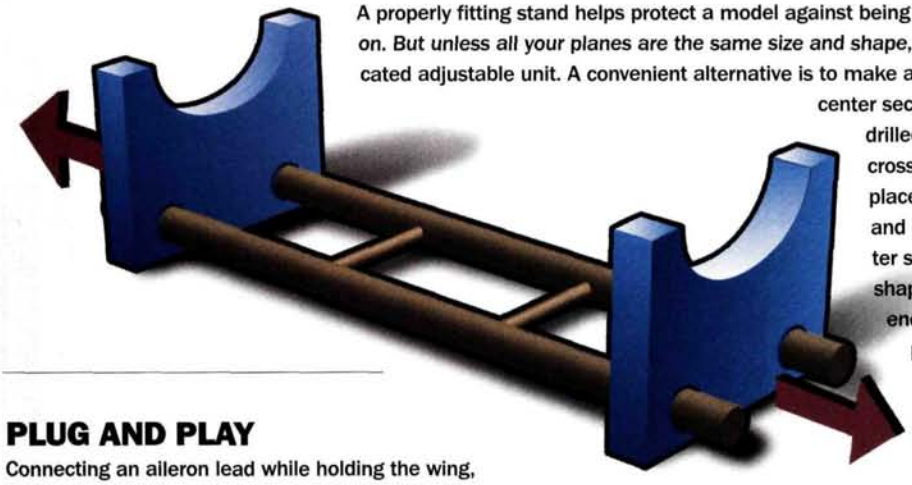
Check out this big, brawny gas engine from Aerotech Models. It was specifically designed for the ⅛-scale Aerotech P-51 Mustang, and it fits beautifully inside the scale cowl. It displaces 44cc (or 2.7ci; hence, the name) thanks to a 40mm bore and a 35mm stroke, and it has plenty of power for realistic scale flight. The engine features a C&H Electronics ignition system, and Aerotech has an optional return-to-center header and quiet pipe. It weighs 4.8 pounds and is recommended for use with a 20x10 prop. Price: $775.

Aerotech Models Inc. (612) 721-1285; aerotechmodels.com.

TIPS & TRICKS

SEND IN YOUR IDEAS. *Model Airplane News* will give a free, one-year subscription (or one-year renewal, if you already subscribe) for each idea used in "Tips & Tricks." Send a rough sketch to *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we can neither acknowledge each one nor return unused material.

IN GOOD STANDING



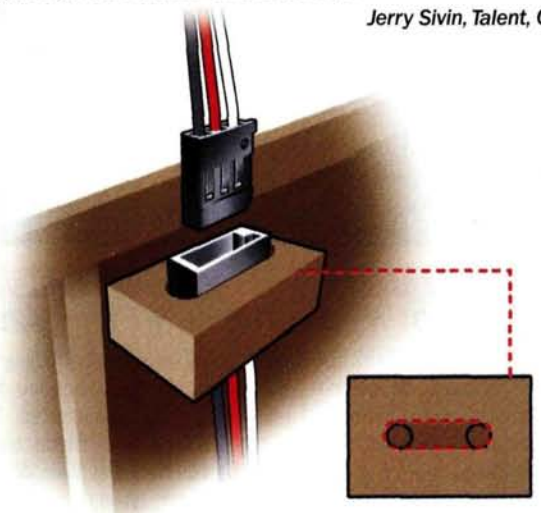
A properly fitting stand helps protect a model against being dinged and dented and makes it much easier to work on. But unless all your planes are the same size and shape, you'll probably need several stands or a heavy, complicated adjustable unit. A convenient alternative is to make a stand with replaceable foamboard end pieces. Make a center section out of two lengths of ¾-inch dowel that you've drilled holes in for ¼-inch dowel cross-braces. Insert the cross-braces to form a "ladder" and glue the dowels into place. Cut rectangles of ½-inch-thick blue or pink foamboard, and drill ¾-inch holes in them for the dowel ends on the center section. Cut out a cradle in each foam block that fits the shape of your model, and slide the blocks onto the dowel ends. You can quickly and easily cut a pair of foam end pieces to fit every new model, and swapping them takes just seconds. The stand can be broken down for transportation just as quickly.

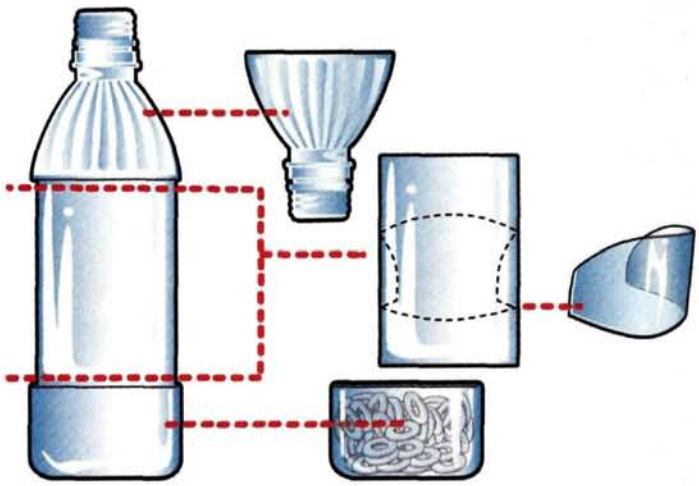
Lee Richter, New Berlin, WI

PLUG AND PLAY

Connecting an aileron lead while holding the wing, the lead and the connector in the fuselage requires a third hand, double-jointed fingers, or some juggling. Add an inconveniently timed gust of wind and you can easily end up with a dinged wing. To avoid this, fix the receiving connector in the fuselage using a simple balsa block. Drill two holes in a small block, and then use a rotary tool to connect the holes to form a slot that's approximately the size of your connector. Insert the connector, CA it into place, and mount the block on the inside of the fuselage near the wing mount where it will be easily accessible. With this setup, connecting your wing requires just two hands. What a concept!

Jerry Sivin, Talent, OR





A BETTER WAY TO RECYCLE

One and two-liter plastic bottles provide excellent modeling materials. The center section is ideal as windshield material; its curve naturally follows the contour of many fuselages. It's flexible enough to be bent and shaped, and it can be trimmed cleanly and easily. You can use the top of a bottle as a fuel funnel, and the bottom makes a great epoxy mixing bowl or parts storage container.

Don Sektnan, Eagan, MN

CUT-RATE COVER CUTTERS

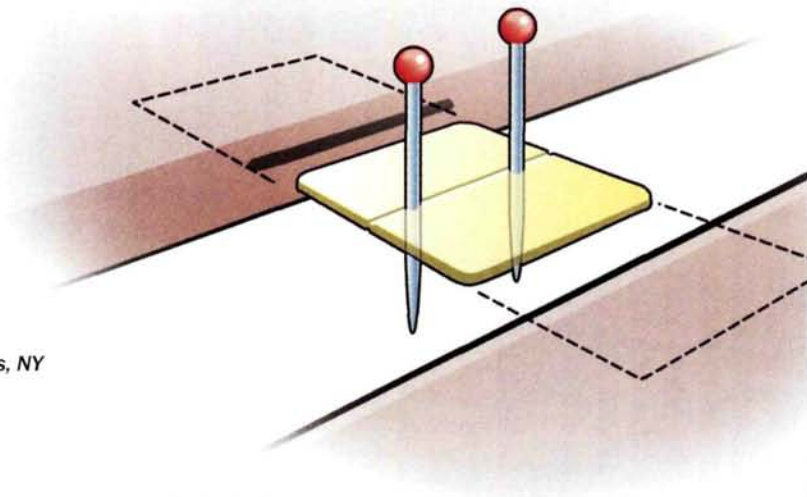
A common, scroll-shaped letter opener makes a surprisingly effective tool for cutting airplane covering material. The slot in the bottom feeds the material in flat for a smooth cut. The cutters are sharp enough to slice the covering without hanging or snagging on it, and the handle makes it easy to cut in one long, smooth motion. Best of all, lots of businesses use these letter openers as advertising, so you can probably collect a few without spending a dime.

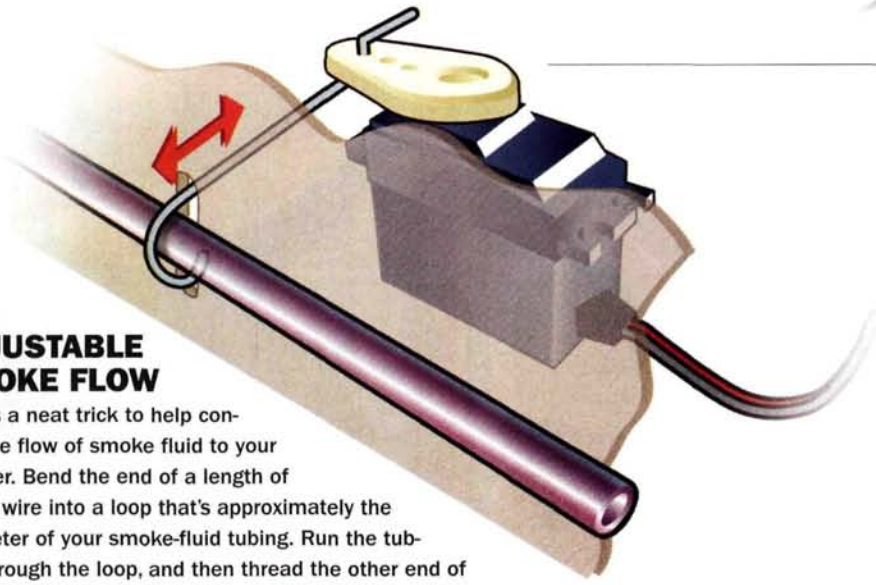
Fredrick Wolfe, Fort Worth, TX

KEEP YOUR HINGES ON THE STRAIGHT AND NARROW

Do you have trouble keeping CA hinges straight when you install them? Try inserting a couple of straight pins through the hinge line to serve as stops when you install the components. Feed each side of the hinge material into the hinge slots, and use the pins to reposition the material as necessary. When you have the hinge lined up, carefully remove the pins before you apply CA or you'll be flying with the pins still in place!

William Masetti, Somers, NY





ADJUSTABLE SMOKE FLOW

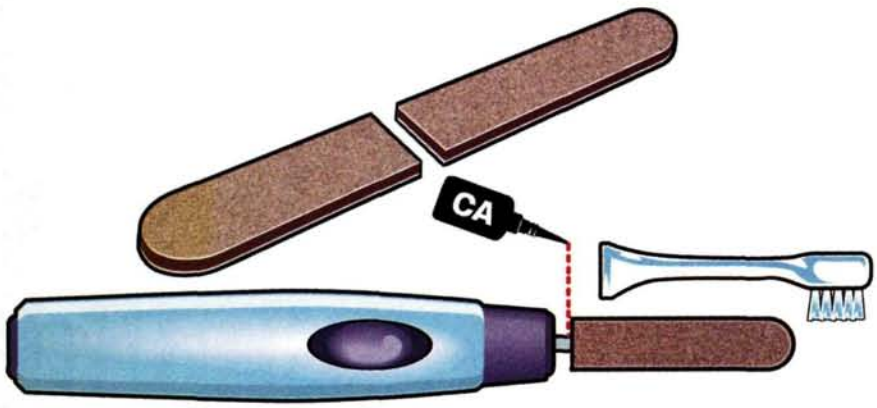
Here's a neat trick to help control the flow of smoke fluid to your muffler. Bend the end of a length of piano wire into a loop that's approximately the diameter of your smoke-fluid tubing. Run the tubing through the loop, and then thread the other end of the wire through a small hole drilled in a plywood plate. On the other side of the plate, attach the wire to your servo. As the servo rotates, the piano wire will squeeze the tube against the plywood plate and will restrict the flow of fluid.

Hisham Bu Jawdeh, Beirut, Lebanon

EASY-TO-INSTALL EYELETS

The brass eyelets that come with rubber servo grommets are often a tight fit, and they can be tiresome to install by hand. A handy alternative is to use a punch or a piercer to apply them. Mount the grommet on the servo, and slip the eyelet over the tip of the punch. Then use the leverage of the punch to pop the eyelet into place. When you want to remove it, just insert the punch from the top. Be careful not to get your other hand in the way of the tip, and be sure to brace the servo on its casing rather than on the output gear to avoid damaging the servos by putting pressure on them.

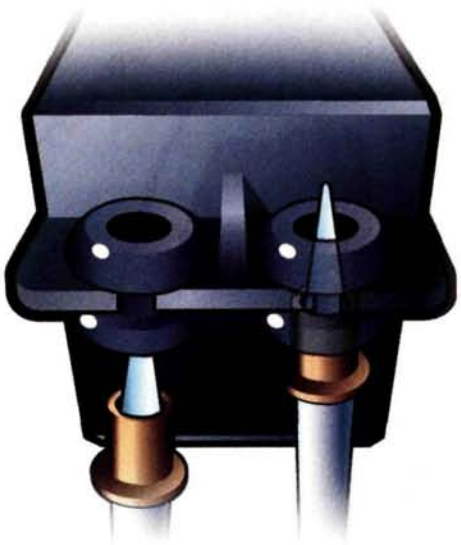
Tony Paladino, Woodstock, Ontario, Canada



FILE THIS TIP!

Mini reciprocating sanders are a clever idea, and you can buy them from a few sources for about $70. Or, for less than $20 in parts, you can make your own. Most common electric toothbrushes provide the same reciprocating motion as a sander. Simply pop off the removable brush head and attach a piece of an emery-board nail file to the shaft; it's OK to CA it on. You can mount different grits of sandpaper to the emery board with spray adhesive, and the emery board can be trimmed or shaped to fit any application.

Rodney Myers, Platteville, WI



PILOT PROJECTS

SEND IN YOUR SNAPSHOTS. *Model Airplane News* is your magazine and, as always, we encourage reader participation. In "Pilot Projects," we feature pictures from you—our readers. Both color slides and color prints are acceptable but please do not send digital printouts. We receive so many photographs that we are unable to return them. All photos used in this section will be eligible for a grand prize of $500, to be awarded at the end of the year. The winner will be chosen from all entries published, so get a photo or two, plus a brief description, and send them in! Send those pictures to "Pilot Projects," *Model Airplane News*, 100 East Ridge, Ridgefield, CT 06877-4606 USA.

Eric Brathwaite
Republic of Panama
¼-SCALE KELEHER LARK
Eric couldn't have picked a prettier plane to scratch-build; it's modeled after the full-scale, homebuilt aerobat. This 69-inch-span beauty is constructed of balsa, ply and spruce, is covered with Super Coverite and painted with acrylic lacquer. Eric uses a Futaba 7UAP radio system with FMA servos and powers the model with an O.S. .70 Surpass for that realistic sound. Keep up the good work, Eric!

Jerome Bobay
Dryden, Ontario, Canada
THUNDER BUG 40
Jerome knows a great flying plane when he sees one, but he decided he wanted to personalize his Balsa USA Thunder Bug. He started by reshaping the nose for a more streamlined look and then added a dorsal fin and a canopy that he made by shrinking a plastic soda bottle over a homemade plug. To cover the one-of-a-kind Bug, Jerome used Tower Hobbies yellow and dark blue UltraCote; power is provided by a color-matched O.S. .40LA with a Master Airscrew prop. After flying the plane for a season, Jerome reports that it still looks and flies great. Nice job!

George Negraiff
Goderich, Ontario, Canada
GOLDBERG SUPER CHIPMUNK

This classic stunt plane is powered by a Webra .80 that swings a 13x6 prop and gives the plane almost unlimited vertical performance. George covered the model with UltraCote and then painted the red and blue details using Rustoleum spray paint. To protect the finish, he sprayed the model with a few coats of a water-based polyurethane. He also added flaps that he controls with his 6-channel Airtronics radio. George writes that he has a lot of fun flying his Chipmunk.

Yuji Kemmochi, Tokyo, Japan
CHESTER JEEP
Although the islands of Japan may be small, the folks there like to build their models large, as is evident by Yuji's 42.5-percent-scale Jeep. Built from a Wendell Hostetler plan, the 24-pound model spans 84 inches and is constructed of balsa and ply. The Thompson Trophy racer is covered with Sig Koverall and finished with automotive paint. With a Brison 4.2 swinging a Zinger 22x12 propeller, we're sure this racer rounds the pylons at heart-pounding speeds. Yuji uses a JR radio, and for special effects, he installed a B&B smoke system. Could a large-scale Gee Bee be next?

Gale Sherman, Omaha, NE, **OV-10 BRONCO**
A longtime modeler, Gale built this neat twin-powered Bronco from a Rich Uravitch plan that was published in the February 2001 issue of *Model Airplane News*. The plane weighs 12 pounds and is powered by two O.S. .46 FX 2-stroke engines. He covered the model in dove gray MonoKote to replicate the markings from a squadron that was stationed in Bien Thuy, Vietnam, in 1971. The Bronco features working flaps, Spring Air retracts and a detailed cockpit with J'Tec instruments (photo by Jeff Ward).

Wes Missler, Bellevue, OH
EXTRA 300S

Wes built this 64-inch-span aerobatic hot-rod from a Great Planes kit, covered it with MonoKote and painted the cowl, wheel pants and landing gear with matching LustreKote. The plane weighs 9 pounds and is guided by a Futaba radio. Wes says that with an O.S. 1.20 4-stroke up front, the Extra has unlimited vertical and is an "anything goes" airplane. Did we mention that he's only 15 years old, and this is his first kit? If Wes keeps this up, he could one day be a Tournament of Champions pilot!

MICHAEL DEMITA, Roswell, GA
BELL 47-G II HELICOPTER

Michael really likes to detail his scale choppers, and because he had access to a full-scale heli, he wanted to make his model as accurate as he could. He started with a Vario Bell 47 and added functional navigation lights and spotlights. That big bubble canopy demanded a full cockpit, so he fully detailed it with seats, a map pocket (with maps), various levers and switches and an instrument panel that has dials and gauges from a popular Microsoft flight sim. The Zenoah G-23-powered helicopter weighs about 14 pounds and has a steel-truss tail boom for the utmost in realism. We think he hit the nail on the head with this great-looking chopper!

Fred Mulholland, Tampa, FL
LOCKHEED ORION
Fred used 3-views that he scaled up to 6 feet to build this beautiful model. Powered by an O.S. .91 Surpass 4-stroke and a 14x7 Master Airscrew 3-blade prop, the Lockheed looks great on the water during takeoffs and landings. The fuselage is planked with balsa and covered with silk and Aerogloss dope. The floats are balsa-covered foam and also covered with silk. Fred hopes that his model is around longer than the full-scale plane was; it lasted only 11 days!

John Niezelski,
St. James City, FL
STINSON SR-9
John built this 100-inch-span, giant-scale Stinson Reliant from a popular Top Flite kit, and he painted it based on Scale Aircraft Documentation photos. He writes that the SR-9 is powered by a Zenoah G-45 and is controlled by a Futaba 8 UAP radio that uses eight servos—including one for flaps. Classics such as this one sure do look great!

Chris Coleman
Lexington, KY
KYOSHO T-33 SHOOTING STAR
As a way to show his support for U.S. troops overseas, Chris decided to decorate his T-33 in our nation's colors; he used star-shaped stickers that he bought at a craft store as stencils. He uses a Futaba 4-channel radio and a 7-cell, Sanyo KR-1500 battery pack in this patriotic plane and notes that the model weighs only 37 ounces and has excellent flight performance.

Mustang

by the Model Airplane News *crew*

If any aircraft symbolizes the grace and power of the fighters flown in WW II, it is the mighty P-51 Mustang! The P-51 in all its incarnations qualifies as a hugely successful mechanical masterpiece. Its flowing lines, under-slung air scoop and bubble canopy all contribute to its being one of the most popular aircraft of all time.

It's likely that more RC models have been built of the North American Mustang than of any other airplane, and it's a safe bet that most—if not all—modelers have had at least one Mustang in their modeling repertoire. An RC Mustang will surely produce fond memories for anyone who has ever glued the pieces together!

In this article, we have assembled an impressive herd of P-51s. Including all kinds of kits, ARFs, ARCs and electric foamies, our guide provides an up-to-date view of all the Mustangs available today! Whether you want a super-scale competition bird or a fun-scale sport job, a backyard flyer or an easy-to-assemble ARF—in foam, fiberglass and wood—we've got you covered. For warbird lovers and Reno Racer fans alike, there's nothing like a big helping of Mustang to get the adrenaline flowing!

We've arranged the main source chart by engine size and by kit type. You can easily check wingspan and other specifications to see which manufacturer has the Mustang you want. Saddle up, pard; it only gets better from here!

House of Balsa .10 profile Mustang

TAMING THE MUSTANG—TAKEOFFS AND LANDINGS

Different planes require a variety of flying styles, and the Mustang is no exception. Because it's a heavy-metal, tail-dragger warbird, certain considerations need to be taken into account—especially during takeoffs and landings. We've seen many Mustangs flown over the years at various events, and the flights that impressed us most were the ones for which the takeoffs and landings were executed in a scale-like manner. Here are some tips to help you attain the utmost in scale realism.

House of Balsa .20 Mustang kit

Fiberclassics gas-powered P-51 Mustang kit

Mania!

A stampede of model P-51s

The World Models ARF .40 to .60 Miss America

Herr Engineering ½A kit

MRC/Altech .40 to .60 EZ Mustang

TAKEOFFS

Handled improperly, getting airborne can be a challenging task. If you fly off a smooth surface, use full down-elevator when you taxi downwind, as the wind will push down on the top of the elevator and help hold the tail down. On a grass runway, use full up-elevator to keep the tail "glued" to the ground. This helps prevent the prop from hitting the ground if the model hits a bump and noses over. Don't forget to apply aileron in any crosswind. If the wind blows from the model's left, use full left aileron; the wind will push down on the wing and prevent it from lifting.

After you turn the model onto the runway centerline, do a final control check and take a deep breath. Gradually apply the throttle, hold up-elevator, and steer with rudder. As the speed builds, slowly release the elevator; the tail will rise. As you approach full throttle, continue steering with rudder until flying speed is attained. Apply slight up-elevator to rotate the model to a positive angle of attack, and the model will become airborne.

As the angle of attack increases, you'll need to add more right rudder to compensate for P-factor (the prop force that tries to swing the nose to the left). As you gain altitude, raise the landing gear and then the flaps (if you use any) and make your turn out of the traffic pattern. By now, your Mustang should be flying at full speed and ready for action.

Hangar 9's .60-size ARF includes installed retracts.

LANDINGS

When you've finished dogfighting that Messerschmitt Bf109, you'll need to return to base and land. If your P-51 has retracts, it's a good idea to make a pass down the runway

VMAR .40-size ARF Big Beautiful Doll

Left: the World Models' ARF P-82 uses two .40s. Center: House of Balsa 1/12-scale Mustang. Right: Pica Enterprise's 1/2A Mustang is a quick-building kit.

after you've lowered the gear; you'll be able to see whether the gear is down and in the landing position. Make the pass upwind so you can enter the landing pattern.

The World Models Dago Red is a great companion to its Miss America.

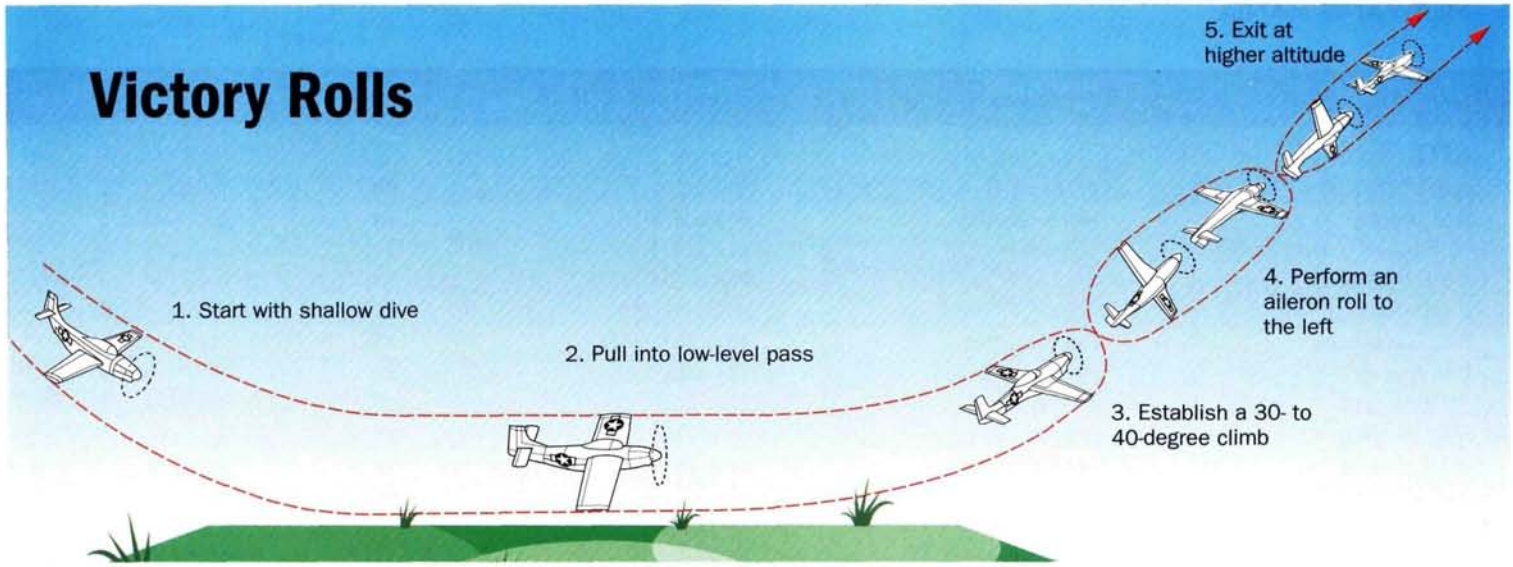
As you turn onto the crosswind leg, start reducing throttle to lower the model's airspeed. Establish the downwind leg, and if your model has flaps, lower them about ¼ of their travel to further reduce airspeed. Retrim the elevator as necessary for level flight. At this point, your throttle setting should be around ½, depending on the size and weight of the model. If there is a strong wind, you'll also have to compensate for that.

Great Planes' .40-size P-51D kit

As you turn onto the base leg, lower the flaps fully and further reduce the throttle. Turn the model onto final approach and line up with the runway centerline. Use throttle to control the descent rate and the elevator to control airspeed. If there is a crosswind, coordinate ailerons and rudder to keep the wings level. Adjust power, pitch and bank as you guide the plane over

Model	Manufacturer	Engine required	Construction	Type
READY-BUILTS				
P-51D Mustang	Pica Enterprises	.10 to .15	ARC	1/12 semi-scale combat
P-51D Mustang	Pica Enterprises	.10 to .15	ART	1/12 semi-scale combat
Lazy Tiger P-51	Thunder Tiger	.20 to .30 (2)	ARF	Slow fly
P-51B Mustang	Pica Enterprises	.21 to .26 (2)	ARC	1/12 semi-scale combat
P-51D Mustang	Jamara	.21 to .35 (2)	ARF	Semi-scale
P-82 Twin Mustang	The World Models	.32 to .40 (2); .40 (4) (X2)	ARF	Semi-scale
Miss America P-51 Mustang	AirBorne Models	.40 to .46 (2); .60 to .70 (4)	ARF	Sport-scale
P-51 Mustang	AirBorne Models	.40 to .46 (2); .60 to .70 (4)	ARF	Sport-scale
P-51D Mustang	Kyosho	.40 to .46 (2); .48 to .53 (4)	ARF	Sport-scale
P-51 Mustang	Model Tech	.40 to .46 (2); .52 to .61 (4)	ARF	Sport-scale
P-51 Mustang	The World Models	.40 to .46 (2); .60 to .70 (4)	ARF	Semi-scale
P-51B Mustang	Morris Hobbies	.40 to .49 (2)	ARF	Sport-scale
P-51D Mustang	Morris Hobbies	.40 to .49 (2)	ARF	Sport-scale
P-51D Mustang 40	Great Planes	.40 to .50 (2); .60 to .80 (4)	ARF	Sport-scale
Dago Red	MRC	.40 to .50 (2); .70 to .80 (4)	ARF	Sport-scale
OK EZ Voodoo	MRC	.40 to .50 (2); .70 to .80 (4)	ARF	Sport-scale
P-51D Mustang	VMAR	.40 to .53 (2)	ARF	Semi-scale
P-51D Mustang 45	MRC	.45 (2); .70 (4)	ARF	Sport-scale
P-51 Sport	Lanier RC	.45 to.90 (2)	ARF	Semi-scale
Dago Red Mustang	AirBorne Models	.46 (2); .70 (4)	ARF	Sport-scale
Dago Red	The World Models	.46 (2); .70 (4)	ARF	Semi-scale
Miss America	The World Models	.46 (2); .70 (4)	ARF	Semi-scale
P-51 Mustang	Flair Products	.60 (2); .90 to 1.20 (4)	ARF	Sport-scale
P-51 Mustang	GiantScalePlanes.com	.60 (2); .91 to 1.20 (4)	ARF	Sport-scale
Midget Mustang	AirBorne Models	.60 (2); .90 (4)	ARF	Sport-scale
P-51D Mustang	Hangar 9	.60 to .78 (2); .72 to 1.00 (4)	ARF	Sport-scale
Super Mustang	Jamara	.60 to .90 (2)	ARF	Sport-scale
P-51D Mustang G.S.	The World Models	.91 to 1.40 (2); 1.40 to 1.80 (4)	ARF	Sport-scale
P-51D Mustang GS	AirBorne Models	1.6 (2); 1.8 (4)	ARF	Sport-scale
Miss America P-51D Mustang GS	AirBorne Models	1.6 (2); 1.8 (4)	ARF	Sport-scale
P-51 Mustang	GiantScalePlanes.com	60 to 70cc (gas)	ARF	Sport-scale

LEGEND: FG = fiberglass, fuse = fuselage, (2) = 2-stroke, (4) = 4-stroke, gas = gas engine, const = construction, ARF = almost ready to fly, ARC = almost ready to cover, ART = almost ready to trim, RTF = ready to fly, (X2) = twin engine



If you fly a Mustang, you need to fly like an ace! An impressive maneuver is the climbing victory roll. It's easy to do, and it looks great—a prototypical fighter maneuver performed by returning pilots!

the threshold. When the model is about 5 feet above the runway, let it settle, and chop the throttle to idle.

When the wheels touch down, use down-elevator to keep the model on the ground and steer with rudder; the ailerons should be deflected into any crosswind. Two-point wheel landings look best and are easier to do than 3-point landings. Landing your model at a higher airspeed helps maintain positive control for a longer time during the approach and touchdown. If you try to land in a 3-point or stalled landing and then flare too early, you can easily stall the wing too soon, and the model can drop onto the runway. When the rollout stops, turn off the runway and taxi back. Good luck, and don't forget to check your six!

Wingspan (in.)	Wing area (sq. in.)	Weight (lb.)	No. of channels	Price	Notes
35.5	220	2.25	4	$79.95	All wood const.; ready to cover; ABS cowl; pushrods installed; decals
35.5	220	2.25	4	$89.95	All wood const.; covered; ready to trim; ABS cowl; pushrods installed; decals
53.5	740	2.5 to 3.5	4	$119.99	All wood const.; covered; includes hardware, decals
40	278	2.75	4	$124.95	All wood const.; ready to cover; ABS cowl; pushrods installed; decals
48	550	3.3 to 3.9	4	$195	FG fuse; wood const.; covered; includes hardware, decals; retracts not available
70.5	736	9.5	6	$329.99	All wood const.; covered; FG cowls; flaps; includes hardware, decal; retracts installed
57.5	585	6	5	$189.99	All wood const.; covered; hardware, decals; retracts installed
57.5	585	6	5	$189.99	All wood const.; covered; hardware, decals; retracts installed
54.7	527	5.5 to 5.8	4 to 5	$169.99	All wood const.; covered; painted plastic cowl; hardware, decals; retracts optional
57	540	5.25 to 5.5	4 to 5	$229.99	All wood const.; covered; hardware, decals; includes fixed gear and retracts
57.5	585	6	5	$189.99	All wood const.; covered; hardware, decals; retracts installed
58.2	590	5.9 to 6.4	5	$179.95	All wood const.; covered; hardware, decals; retracts installed
58.2	590	5.9 to 6.4	5	$179.95	All wood const.; covered; hardware, decals; retracts installed
57	580	6.75	4 to 5	$199.99	All wood const.; covered; FG cowl; hardware, decals; retracts optional
54.7	532	5.75 to 6	5	$360	Balsa and plywood const.; covering has panel lines and rivet detail; includes retracts
54.7	532	5.75 to 6	5	$360	Balsa and plywood const.; covering has panel lines and rivet detail; includes retracts
60	580	6 to 6.5	4	$149.95	All wood const.; covered; FG cowl; hardware, decals
54.7	532	5.75 to 6	5	$360	Balsa and plywood const.; covering has panel lines and rivet detail; includes retracts
63	630	6	4	$69.99	Plywood fuse w/plastic covering; covered foam wing;
57.5	585	6.5	5	$199.99	Painted FG fuse; covered; hardware, decals; retracts installed
57.5	585	7	5	$214.99	Painted FG fuse; covered; hardware, decals; retracts installed
57.5	585	7	5	$214.99	Painted FG fuse; covered; hardware, decals; retracts installed
68	816.85	8.75 to 9.25	6	$348	Painted FG fuse; foam wing; includes hardware, decals; retracts optional
68	816.85	8.75 to 9.25	5 to 6	$279.99	Painted FG fuse; foam wing; includes hardware, decals; retracts optional
60	668	7.5	4	$249.99	All wood const.; covered; FG cowl, wheel pants; hardware; available in 4 colors
65.5	745	7 to 8.5	5	$254.99	All wood const.; UltraCote covered; includes hardware, decals, retracts
64	650	6 to 7	4	$299	All wood const.; covered; includes hardware, decals
80.5	1,155	13.8	5	$499.99	All wood const.; covered; FG painted cowl; 2-pc. wing/stab; hardware, decals; retracts included
80.5	1,155	15	6	$499.99	All wood const.; covered; FG cowl; includes retracts, hardware, decals; available in 4 colors
80.5	1,155	13	5	$499.99	All wood const.; covered; FG cowl; includes retracts, hardware, decals
96	1,414	24 to 27	5 to 6	$874.99	Gelcoated FG fuse; foam wing; covered; includes hardware, decals; retracts optional

Model	Manufacturer	Engine required	Construction	Type
KITS				
Simple Series P-51	Ace Hobby	.049 to .074	Kit	Schoolyard
P-51 Mustang	Herr Engineering	.049 to .074	Kit	Semi-scale
P-51 Combat powered foamie	JK Aerotech	.049 to .25 (2)	Kit	Semi-scale
P-51D Mustang	House of Balsa	.051 to .10 (2)	Kit	Semi-scale
P-51D Mustang Profile	House of Balsa	.061 to .12 (2)	Kit	Semi-scale profile
F-82 Twin Mustang	Pica Enterprises	.10 to .15 (2) (X2)	Kit	1/12 electric semi-scale
P-51 Mustang	PMA	.12 to .15 (2)	Kit	1/12 semi-scale combat
P-51D Mustang	K&A Models	.15 to .25 (2)	Kit	Semi-scale
P-51D Mustang .20	House of Balsa	.19 to .21	Kit	Semi-scale
P-51D Mustang	Pica Enterprises	.21 to .26 (2)	Kit	Semi-scale
P-51B Mustang	Pica Enterprises	.21 to .26 (2)	Kit	Semi-scale
Mustang 30	MRC	.25 to.30 (2); .40 to .50 (4)	Kit	Sport-scale
Check Six North American P-51	Turnkey RC	.26 (2)	Kit	1/12 semi-scale combat
Morris Mustang	Morris Hobbies	.32 to .46	Kit	Profile fun-fly
P-51D Mustang 40	Great Planes	.40 to .50 (2); .60 to .80 (4)	Kit	Sport-scale
P-51D Mustang	Top Flite	.61 to .90 (2); .90 to 1.2 (4)	Kit	Sport-scale
P-51D Mustang	Pica Enterprises	1.08 to 1.60 (2)	Kit	Scale
P-51 Mustang	Century Jet Models Inc.	1.8 (2) or larger	Basic kit	Scale
P-51 Mustang	Century Jet Models Inc.	1.8 (2) or larger	Deluxe kit	Scale
P-51 Mustang	Century Jet Models Inc.	1.8 (2) or larger	Deluxe kit	Scale
P-51D Mustang	Aerotech Models	2.1 (2)	Kit	Scale
P-51D Mustang	Top Flite	2.1 to 2.8 (2, 4); 41 to 70cc (gas)	Kit	Sport-scale
P-51D Mustang	Pica Enterprises	35cc to 45cc (gas)	Kit	Scale
P-51D Mustang	Cactus Aviation	4.9 to 7.0 (gas)	Kit	Scale
P-51 Mustang	Iron Bay Model Co.	42cc (gas)	Kit	Sport-scale
P-51D Mustang	Fiberclassics	60 to 80cc (gas)	Kit	Scale
P-51D Mustang	K&A Models	None	Kit	PSS slope soarer
P-51 Mustang	Canterbury Sailplanes	None	Kit	PSS slope soarer
ELECTRICS				
P-51 Mustang	Guillow's	Rubber powered	Kit	Semi-scale
Micro P-51D Mustang	Dymond Modelsports	Geared 180 can motor	ARF	Park flyer
P-51D Mustang	Hobby Lobby	Geared 180 can motor	ARF	Park flyer
P-51D Mustang	GWS	370 direct-drive can motor	ARF	Park flyer
P-51D Mustang	Megatech	Speed 400 geared 5.6:1	RTF	Semi-scale
Dago Red Electric	K&A Models	Speed 400 6V motor	Kit	Semi-scale
Electric Mustang	Pica Enterprises	Speed 400 to 480	Kit	1/12 electric semi-scale
P-51D Mustang Electric	K&A Models	Speed 600 w/2.3:1 gearbox	Kit	Semi-scale

LEGEND: FG = fiberglass, fuse = fuselage, (2) = 2-stroke, (4) = 4-stroke, gas = gas engine, const = construction, ARF = almost ready to fly, ARC = almost ready to cover, ART = almost ready to trim, RTF = ready to fly, (X2) = twin engine

Wingspan (in.)	Wing area (sq. in.)	Weight (lb.)	No. of channels	Price	Notes
35	182	1 to 1.4	3 to 4	$34.99	Balsa/foam const.; includes decals; can be converted to electric
48	328	1.4	4	$71.99	Laser-cut all balsa const.; includes hardware, decals
38	275	1.5 to 2	2 to 4	$36	All foam const.; designed for extreme combat abuse; includes hardware
36	216	1.5 to 1.8	2 to 4	$59.95	All wood const.; plastic fuse top; includes decals
36	279	1.5 to 1.7	2 to 4	$59.95	All wood const.; photo-illustrated instructions; includes decals
51	373	3.5 to 4.5	4	$99.95	Laser-cut all balsa const.; includes hardware, decals
37	240	1.75 to 2.1	4	$60	Laser-cut all wood const.; designed for combat; hardware not included
36	211	1.8 to 2.2	3	$129.99	FG fuse, cowl, air scoop; foam wing; clear canopy; plan
43	334	2.5 to 3	4	$64.95	Balsa and plywood const.; plan, decals
40	278	2.75	4	$89.95	Laser-cut balsa and plywood const.; ABS cowl and scale details; hardware, decals
40	278	2.75	4	$89.95	Laser-cut balsa and plywood const.; ABS cowl and scale details; hardware, decals
47.7	414	4.1 to 4.6	5	$160	All wood const.; molded scale details; hardware, decals
41	280	2.5 to 3	3 to 4	$45	Balsa const.; foam wing; designed for combat
46	700	3.75 to 5	4	$89.95	Balsa and plywood const.; plan, decals
57	580	6	4 to 5	$99.99	Balsa and plywood const.; includes hardware, decals; retracts optional
65	734	8 to 10	4 to 6	$149.99	Balsa and plywood const.; includes hardware, decals; retracts optional
74	950	14 to 15	5 to 6	$289.95	Laser-cut balsa and plywood const.; ABS cowl and scale details; hardware, decals
82	1,200	21	4 to 6	$410	Primed FG fuse; foam wing, stab and fin; spinner
82	1,200	21	4 to 6	$650	Primed FG fuse; foam wing, stab and fin; wood and accessory package, spinner
82	1,200	21	4 to 6	$1,040	Primed FG fuse; foam wing, stab and fin; wood and accessory package, spinner, retracts
84	1,222	24 to 29	6 to 7	$2,395	Gelcoated CF fuse and wing; molded-in panel lines and rivets, retracts and hardware
84.5	1,245	17.5 to 19	6 to 7	$239.99	All wood const.; molded scale details; hardware, decals; requires retracts
89	1,356	20 to 22	5 to 6	$329.95	Laser-cut balsa and plywood const.; ABS cowl and scale details; hardware, decals
112	1,650	42	7	$2,195	Gelcoated FG airframe; molded-in panel lines, rivets; retracts and accessories available
85	1,350	22.5	6	$779	FG fuse; 2-pc. plug-in foam wing; hardware, decals; optional retracts and power system
102	1,540	30 to 31	6 to 7	$1,999	Gelcoated FG airframe; molded-in panel lines, rivets, etc.; retracts available
36	211	1.5 to 1.7	2	$129.99	FG fuse, cowl, air scoop; foam wing; clear canopy; plan
48	430	1.8	2	$68.60	EPP foam const.; high-level prefab.; includes balsa, hardware, covering
24.75	92	4 to 6 oz.	3	$27.29	Stick and tissue const.; rubber powered; can be converted to electric
22.5	89	4 to 6 oz.	3	$39.95	Rubber powered, painted foamie; can be converted to electric
22.5	89	6.5 oz.	3	$59	Rubber powered, painted foamie; can be converted to electric
30	202	13 to 14 oz.	3	$59.99	All foam const.; painted; includes hardware, decals; retracts optional
32	215	1.3	3	$229.99	All foam const.; painted, with radio and power systems installed
30.5	188.72	12.5 to 13 oz.	3	$109.99	FG fuse, cowl, air scoop; foam wing; clear canopy; plan
35.5	220	2.25	4	$69.95	Laser-cut, all balsa const.; interlocking parts; full-size plan
36	211	2.3 to 2.8	3	$129.99	FG fuse, cowl, air scoop; foam wing; clear canopy; plan

Ace Hobby Distributors *(660) 584-6704; acehobby.com.*
Aerotech Models Inc. *(612) 721-1285; aerotechmodels.com.*
AirBorne Models *(925) 371-0922; airborne-models.com.*
Cactus Aviation *(520) 721-0087; cactusaviation.com.*
Canterbury Sailplanes *canterburysailplanes.co.nz.*
Century Jet Models Inc. *(502) 266-9234; centuryjet.com.*
Dymond Modelsports USA Ltd. *(888) 4FUN FLY; rc-dymond.com.*
Fiberclassics *(630) 904-9983; fiberclassics.com.*
Flair Products Ltd. *flairproducts.co.uk.*
GiantScalePlanes.com *(610) 282-4811; giantscaleplanes.com.*
Great Planes Model Distributors Co. *(800) 637-7660; greatplanes.com.*
Guillow's *(781) 245-5255; guillow.com.*
GWS (Grand Wing Servo); *distributed by Horizon Hobby; gws.com.tw.*
Hangar 9; *distributed by Horizon Hobby (800) 338-4639; horizonhobby.com.*
Herr Engineering; *distributed by Sig Mfg. Co. Inc. (800) 247-5008; iflyherr.com.*
Hobby Lobby Intl. *(615) 373-1444; hobby-lobby.com.*
House of Balsa *(760) 246 6462; houseofbalsa.com.*
Iron Bay Model Co. *(304) 232-7511; ironbaymodelcompany.com.*
Jamara; *distributed by Electric Aero Modeling USA (972) 436-5826; jamara.com.*
JK Aerotech *(503) 663-4081; jkaerotech.com.*
K&A Models *(505) 994-8083; kamodels.com.*
Kyosho; *distributed by Great Planes.*
Lanier RC *(770) 532-6401; lanierrc.com.*
Megatech; *distributed by America's Hobby Center (201) 662-2800; megatech.com.*
Model Tech; *distributed by Global Hobby Distributors (714) 963-0133; globalhobby.com.*
Morris Hobbies *(281) 364-8011; morrishobbies.com.*
MRC (Model Rectifier Corp.) *(732) 225-6360; modelrectifier.com.*
Pica Enterprises Inc. *(305) 935-1436; picaweb.com.*
PMA (Progressive Miniature Aviation) *(800) 325-4277; rccombat.com.*
The World Models; *distributed by Airborne Models; theworldmodels.com.*
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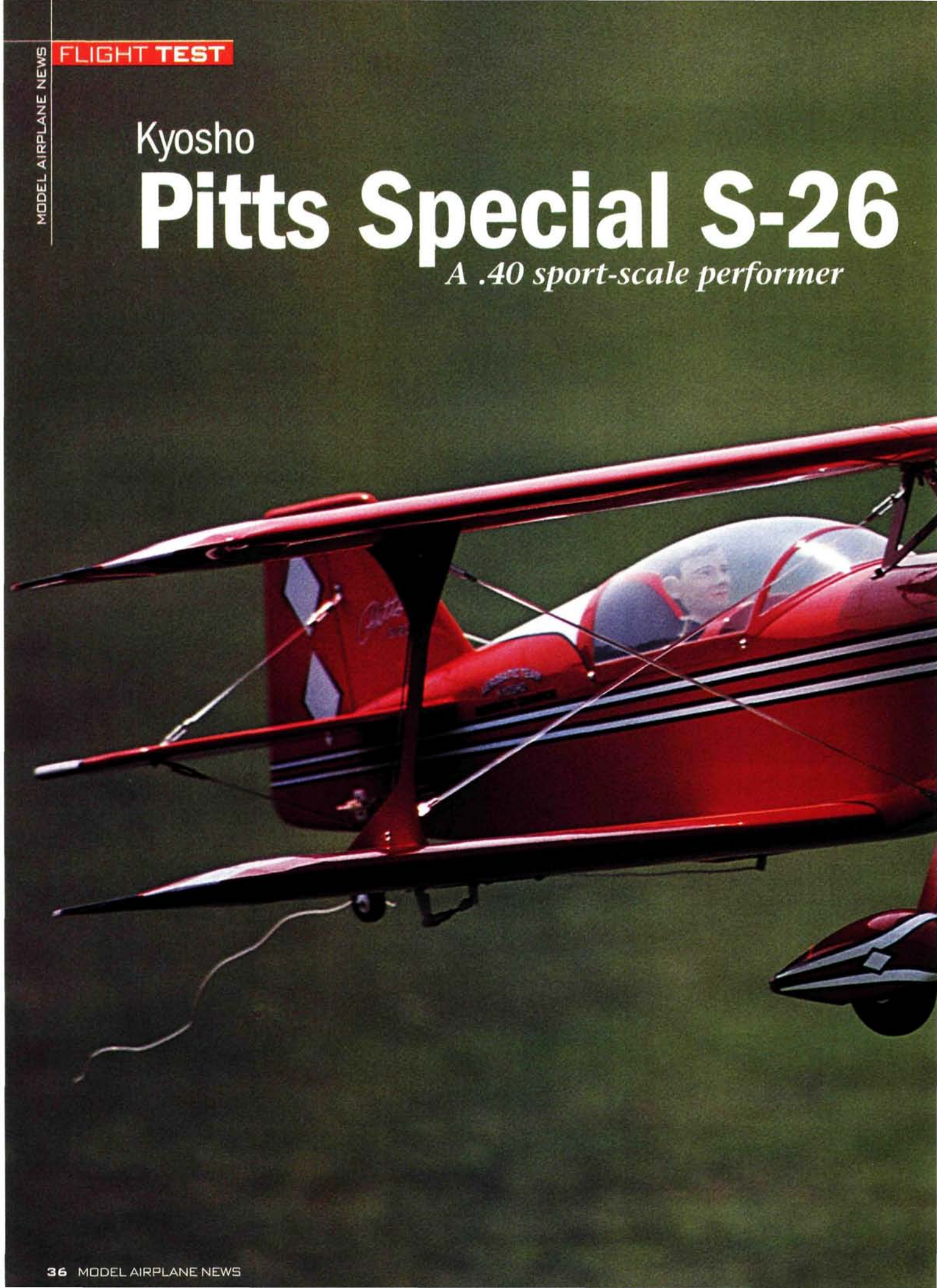
VMAR; *distributed by Richmond RC (877) 727-2329; richmondrc.com.* ✚

Kyosho Pitts Special S-26

A .40 sport-scale performer



by Rick Bell

Little did Curtis Pitts know when he built the first Pitts Special in 1943 that he was making aviation history; more than 50 years later, the Pitts is still setting the standard for aerobatics. Just about every member of the U.S. Aerobatic Team has flown the Pitts in competition, and many female U.S. national champions have used a Pitts Special to claim victory. Now you can create your own airshow with Kyosho's new Pitts Special S-2C .40 ARF. This little beauty comes built and covered in a colorful red, white and blue scale scheme and can be flight-ready after a few evenings of work.

WHAT'S IN THE BOX?

With the exceptions of the radio system, engine, spinner and adhesives, everything you'll need to assemble the model is in the box. The airframe is built and covered with a heat-shrink film that has been expertly applied. The kit includes painted fiberglass wheel pants and cowl, wheels, painted metal interplane and cabane struts, a large, crystal-clear canopy, decal sheet, complete hardware package and a detailed instruction manual. Strangely, the aluminum landing gear was not painted to match the rest of the airplane. As is the standard for Kyosho instructions, there are very few written directions; the pictures and drawings do clarify many details, but not all.

SPECIFICATIONS

MODEL: Pitts Special S-2C .40

MANUFACTURER: Kyosho

DISTRIBUTOR: Great Planes Model Distributors

WINGSPANS (BOTTOM/TOP): 44 in./46 in.

LENGTH: 42 in.

TOTAL WING AREA: 665 sq. in.

WEIGHT: 6 lb.

WING LOADING: 20.76 oz./sq. ft.

RADIO REQ'D: 4-channel with 5 servos (elevator, rudder, 2 ailerons, throttle)

RADIO USED: Futaba 9CAP with 2 Futaba 3001 servos, 1 Futaba 3003 servo and 2 JR DS3421 Mini Digital servos

ENGINE REQ'D: .40 to .46 2-stroke or .52 4-stroke

ENGINE USED: O.S. .46FX 2-stroke

PROP USED: APC 11x6

FUEL USED: Morgan Cool Power 15% nitro

PRICE: $229.99

FEATURES: balsa and ply construction; fully symmetrical airfoil; factory covered in heat-shrink film; painted fiberglass cowl and wheel pants; aluminum landing gear; wheels; fuel tank; engine mount; hardware package; decals; photo-illustrated instructions.

COMMENTS: the Kyosho Pitts Special S-2C bipe is quick and easy to build, and it captures the essence of airshow aerobatics. It is a great performer for experienced pilots who are looking for a little hot-rod.

HITS

- Excellent overall appearance.
- Easy to assemble.
- Crisp flight performance.

MISSES

- Landing gear not painted.
- No cooling air holes marked on cowl.
- Wheel pants mounting method could be more secure.

The Kyosho Pitts Special kit is very complete. It's easy to assemble and looks great when finished.

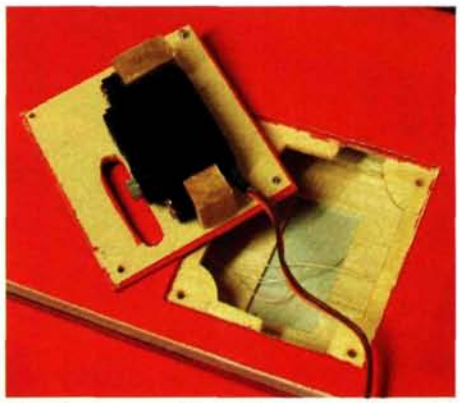
ASSEMBLY

Wings. As is typical of ARFs, assembly starts with the wing, or in this case, wings. There are three sets of dihedral braces that must be laminated together: two for the top wing and one for the bottom wing. The top wing arrives as three sections, and I recommend that you glue one wing panel to the center section and let it cure before you attach the other panel. The bottom wing is in halves that go together without a hitch.

Both wings have ailerons that are hinged using the supplied CA hinges. The bottom ailerons are driven by dual servos mounted in the wing, and the top ailerons are connected to the bottom ailerons via slave pushrods. This system works very well and is simple to set up. After the ailerons have been attached to the top wing, it's completed; put it aside until you need it at final assembly.

The Pitts' airfoil is very thin, and the manual shows two methods of installing either mini- or standard-size aileron servos in the bottom wing. The first way is to mount standard servos vertical on a hatch. If you use this method, the servos will protrude through the top and the bottom of the wing, but plastic covers are supplied to cover the parts of the servos that stick through the top of the wing.

The second method is to mount a miniservo on its side on the underside of a hatch. This is the direction I took; it's a much cleaner installation, as only part of the servo arm is visible. Because of the thinness of the airfoil, I used JR DS3421 Mini Digital servos. To make them fit, I had to remove some material from the plywood wing mounts; they just barely fit in the pockets. After installing the servos, I found that the rest of the wing assembly went quickly.



The wing's symmetrical airfoil is very thin, and I used JR Mini Digital servos that fit completely inside the wing. I had to make cutouts in the wing to allow the hatches to fit properly.

The Pitts' wings are easy to assemble. The top wing is in three pieces and uses two joiners, and the bottom wing is in halves. Both wings have ailerons that allow quick maneuvering.

Fuselage assembly. The major construction centers on the fuselage, and that moves along without too much effort. There were a few areas of concern, and I'll point these out.

The tail feathers have to be epoxied into the provided slots in the rear of the fuselage, and their alignment was perfect (as was the lower wing) when I mounted it on the fuselage. Before I hinged the elevators, I made a joiner wire for them instead of using the suggested forked elevator pushrod. I did this for convenience, as you have to cut the pushrod exits in

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

On takeoff, keep the nose pointed into the wind, or the Pitts will weathervane. As I slowly advance the throttle, I hold some up-elevator to keep the tail down. As the plane speeds up, I release the elevator, and it smoothly lifts off. Because of its fairly short tail moment, be ready to work the rudder or it will quickly get off track.

The Pitts slows quickly during landings, so you have to use the throttle to control its descent rate. The Pitts is equally at home making 3-point and wheeled landings; I think wheeled landings are much prettier. With its large rudder/vertical-fin area, the plane tends to weathervane into a crosswind, so to maintain your heading during a crosswind landing, keep the upwind wing down into the crosswind and add opposite rudder. The Pitts shows no tip-stalling tendencies during landings.

LOW-SPEED PERFORMANCE

The Pitts can be slowed way down before it will stall. A high angle of attack can be attained before the model gently drops a wing and its nose. After doing several stalls, I was confident that it wouldn't snap in a stall. With its four ailerons and large control surfaces, control remains good at slow speeds.

HIGH-SPEED PERFORMANCE

With the O.S. .46FX up front, the Pitts flies faster than I had expected, but its control response is crisp and precise. The use of exponential on the controls is highly recommended.

AEROBATICS

It's a Pitts! What more needs to be said? On low rates, the plane performs nice, graceful aerobatics, but switch to high rates and watch out; it's time to cut loose! Any maneuver you can think of, the Pitts can do: tight loops, drill-bit-like rolls, snaps and knife-edge flight are all within its capabilities. With its symmetrical airfoil, inverted flight requires little effort. All in all, in the hands of an experienced pilot, this is a very capable plane.

the rear of the fuselage. Making one pushrod exit is easier than making two that must be in the same place on each side of the fuselage.

Next, I mounted the landing gear, and it has a rake on its trailing edge; be sure to mount it correctly. As I mentioned earlier, the gear had not been painted to match the rest of the plane, so I painted it with Top Flite LustreKote Missile Red; it almost exactly matches the red covering.

I mounted the wheel pants next and felt that some improvements could be made here. Kyosho provides a single bolt that serves as the axle for the wheel and then goes through the landing-gear leg and is secured with a nut that traps the wheel pant. This method could allow the wheel pant to rotate around the wheel, as there is no antirotation pin to prevent the pant from moving. To prevent this, I added a piece of ⅛-inch plywood as reinforcement to the inside of the pant before I mounted them. I mounted the pants and drilled a small hole through the gear leg and into the plywood that I had added. I then screwed a small sheet-metal screw through the leg and into the plywood to hold the pant in place.

For power, I chose an O.S. .46FX 2-stroke engine with the stock muffler; you could also use a 4-stroke engine, as the firewall has marks for both engine types. The 2-stroke installation is very easy, and a tunnel built in the bottom of the fuselage accommodates the muffler. You'll need only to add an exhaust diverter to the muffler to dump the exhaust out of the bottom of the plane.

I mounted the O.S. engine at a 45-degree angle so the built-in tunnel could accommodate the muffler.

Next, I mounted the cowl; the instructions don't mention that holes should be cut in the cowl for cooling air to enter and exit, and the cowl isn't marked to show you where to cut it. I used the box art as a guide and cut them out with a Dremel Moto-Tool; then I mounted the cowl as shown.

Standard servos easily fit in the radio compartment. I installed the receiver and battery as shown in the instructions, and the center of gravity came out where recommended.

Radio installation is straightforward and presents no problems. I didn't use the supplied pushrods; I used Dave Brown fiberglass pushrods instead. This was just my preference.

Final assembly. Start by mounting the brackets for the interplane and cabane struts. There are pilot holes in the wings, but not in the fuselage, for the screws that secure the cabane strut. To properly position the cabane strut, I first mounted the bottom wing with the interplane struts attached to it. Then I screwed the cabane strut to the underside of the top wing and screwed the assembly to the interplane struts that I had already attached to the bottom wing. If you're lucky, the feet on the cabane strut will line up with the hardwood stringers in the forward turtle deck; if they don't, bend them slightly until

they do. It's then easy to mark where the holes should be and to drill them. Instead of using wood screws to secure the cabane strut, I installed 4-40 blind nuts in the hardwood stringers from the inside of the fuselage; 4-40 bolts are a more secure way to attach the cabane strut.

After mounting both wings, be sure to check their alignment with each other. If you need to, you can gently bend the struts to align them properly; my Pitts required very little tweaking. Next, I attached the hardware for the slave aileron pushrods to the ailerons and then assembled the pushrods. I trimmed the canopy, fitted it to the fuselage and painted the frame outlines from the inside with enamel paint. After I had added the instrument panel, I installed a William Bros. pilot figure. To further dress up the model, I added flying wires following the "Make Scale Rigging" article by Nick Ziroli published in the April 2002 issue of *Model Airplane News*; the flying wires really made the model come to life!

All I had left to do was to balance the Pitts and set up the control throws. With the O.S. up front and the receiver and 1200mAh battery pack mounted where shown in the instructions, no extra weight was needed. Please be sure to use the control throws recommended in the manual. Although they don't look very substantial, remember that the Pitts is a short-coupled, high-performance airplane. As a precaution, I reduced the throws by half and used them for low rates.

Above: to dress it up, I painted the cockpit medium gray and added a Williams Bros. pilot bust. Right: to enhance the model's scale appeal, I added flying wires to the tail feathers and to the wings (as shown on the box art). I used Nick Ziroli's article, "Make Scale Rigging" from the April 2002 Model Airplane News as a guide.

CONCLUSION

The Kyosho Pitts Special S-2C is a neat rendition of an aerobatic plane that has a long and colorful history. With the exception of a few minor points, the model goes together quickly and accurately. As expected with this type of aircraft, its flight performance is lively and exciting.

APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.
Dave Brown Products; (513) 738-1576; dbproducts.com.
Futaba Corp. of America; distributed by Great Planes; futaba-rc.com.
Great Planes Model Distributors Co. (800) 637-7600; greatplanes.com.
JR; distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.
Kyosho; distributed by Great Planes; kyosho.com.
Morgan Fuel (800) 633-7556; morganfuel.com.
O.S.; distributed by Great Planes; osengines.com.
Top Flite; distributed by Great Planes; top-flite.com.
Williams Bros. Inc. (805) 534-1307; williamsbrosinc.com.

Hangar 9 Pizazz ARF

by Bob Van Tassel

A 3D fun-flyer with style!

In the dictionary, "pizazz" is defined as "having flair and excitement." When I opened the box and saw Hangar 9's new Pizazz, I realized that that's exactly what this airplane has. The model comes covered in a dazzling color scheme that rivals any Indy 500 car. The combination of a checkerboard leading edge and see-through UltraCote is striking, and it enabled me to inspect the top-quality material and construction beneath. I couldn't wait to get started.

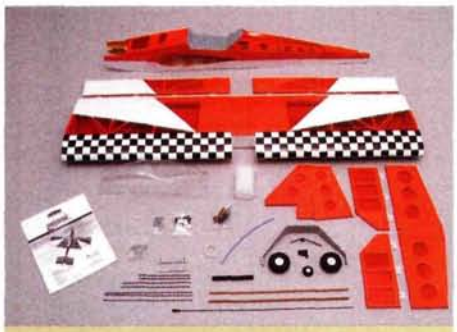
This plane requires minimal assembly and could probably easily be assembled without instructions. Hangar 9, however, has left nothing to chance. It supplies a construction manual that is outstanding and includes 38 pages of photos, diagrams and written text. The manual is worth reading, as it also has many excellent suggestions.

For power, the Saito .72 4-stroke Golden Knight is an excellent choice.

PHOTOS BY WALTER SIDAS & BOB VAN TASSEL

ASSEMBLY

I started by checking my parts against the parts list and was pleased—but not surprised—to find that everything was there and in excellent condition. The UltraCote covering was tight and wrinkle free.



SPECIFICATIONS

MODEL: Pizazz .40 ARF

TYPE: sport 3D fun flyer

MANUFACTURER: Hangar 9

DISTRIBUTOR: Horizon Hobby

WINGSPAN: 48 in.

WING AREA: 725 sq. in.

LENGTH: 48 in.

WEIGHT: 5.4 lb.

WING LOADING: 16.7 oz./sq. ft.

ENGINE REQ'D: .40 to .50 2-stroke or .40 to .72 4-stroke

ENGINE USED: Saito .72 Golden Knight 4-stroke

RADIO REQ'D: 5-channel w/5 servos (rudder, elevator, throttle and 2 ailerons)

RADIO USED: JR X347 with R600 FM receiver, one NES 507 and four NES 537 servos

PROP USED: 12x8 Master Airscrew

FUEL USED: Omega 15%

PRICE: $159.95

FEATURES: balsa and ply construction; comes with aluminum landing gear, fuel tank, wheels, axles, engine mount and all of the necessary hardware; covered in UltraCote.

COMMENTS: the Pizazz is an outstanding addition to the growing number of high-quality ARFs marketed by Hangar 9. This easy-to-build fun flyer surely lives up to its name.

HITS

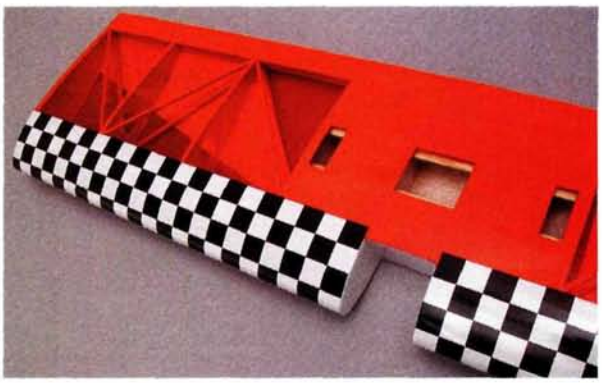
- Striking color scheme.
- Ease of assembly.
- Detailed instruction manual.
- Outstanding flight performance.

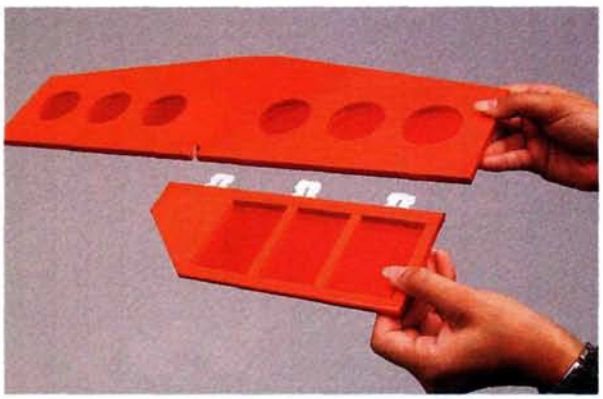
MISSES

- Snap clevises are difficult to fasten.

Wing. I checked the wing opening in the fuselage to be sure that the one-piece wing slipped into the fuselage easily and lined up properly. When I was sure of the proper fit and alignment, I double-coated the inside of the fuselage and engine compartment with a mixture of epoxy and alcohol. While this was drying, I removed the covering from the center section of the wing where it would contact the fuselage, being very careful not to score the balsa underneath. When I was sure everything lined up properly, I glued the wing into place using 30-minute epoxy. After the epoxy had dried, I filled the small gaps between the fuselage and wing with white latex caulk.

Ailerons. The aileron hinges are the CA type. I put a T-pin in the center of the hinge to regulate the hinge depth and then inserted the hinge into the precut slot in the aileron. I then inserted the hinges into the wing until they came to a stop at the T-pin. Then I removed the T-pins and deflected the ailerons a few times to set the gap. When I was sure of the proper gap, I glued the hinges into place using thin CA. After the CA dried, I applied pressure to make certain the bond was secure.





Top: the wing comes in one piece and is completely built and covered. It has a thick fun-fly airfoil. Above: the tail feathers are simple flat surfaces and come slotted for hinge installation.

The Pizazz uses a servo in each wing. I installed each one in its respective servo pocket and then threaded the leads into the fuselage. This required servo extensions. I used some tape to secure the connections before I fed them through to the center section. I then checked the servo movement and secured the servo.

Attaching the aileron linkage is straightforward using the supplied hardware. Z-bend pliers come in handy for the connection to the servo. I used the supplied black clevises, which appear to be molded in an open position. They are resistant to closing, so I used small pieces of fuel tubing to keep them closed.

If you use a computer radio, as I did, Hangar 9 suggests the use of a separate channel for each of the servos. This will provide you with flaperon capabilities.

Tail feathers. I removed the covering from the center section of the stabilizer, again being careful not to score the balsa. I then removed the covering on the fuselage to accept the stab. I trued up the assembly and applied 30-minute epoxy to secure the stabilizer to the fuselage. I had to make the slots for the elevator hinges deeper because they bottomed out and left a gap, but I postponed gluing the elevators into place.

I installed the fin in pretty much the same manner as I had the stabilizer. I used 30-minute epoxy so I had enough time to ensure that the fin was exactly 90 degrees to the stabilizer. I used masking tape to hold the fin in place while the epoxy dried.

The tailwheel assembly is a tiller type. I glued the nylon bearing into the fuselage and the tiller wire into the rudder. The rudder hinges were then glued into place with thin CA, using the same process as the ailerons. Next, I CA'd the elevators into place. I made sure to use pins as spacers to set the gap in the elevator. The final step in the tail-feather assembly is the attachment of the control horns.

Engine installation. First, I assembled the fuel tank and attached the fuel lines; then I placed the tank in the body. I color-coded my lines using red for exhaust. The installation of my Saito .72 Golden Knight was

FLIGHT PERFORMANCE

With the exception of the rudder, I set up all control throws per the manufacturer's recommendations. To produce a good spin, I did eventually have to increase the rudder throw as the manufacturer recommended.

TAKEOFF AND LANDING

I point the Pizazz into the wind and slowly feed in a little right rudder. At about 75 feet out, the Pizazz gets off the ground and climbs out with just a touch of up-elevator. The Saito .72 Golden Knight is a perfect combination, and I am able to climb out at ½ throttle.

To check the stall, I took the model up high and made a few minor trim corrections. Gradually, I reduced the throttle and fed in some up-elevator. The Pizazz will continue flying in a nose-high attitude for some time before the nose drops straight forward and the plane starts to fly again.

To land, I reduce the throttle to idle and line up with the runway on final. With a little crosswind correction, the Pizazz floats down the runway a few feet off the ground for more than 200 feet and touches down at a walking speed.

HIGH-SPEED PERFORMANCE

The Pizazz performs very respectably at high speed. I don't worry about ripping off my tail surfaces, though I have seen this happen with other 3D performers.

LOW-SPEED PERFORMANCE

Low-speed flight and maneuvers are a hoot. I like to idle back and do a low, slow flyby across the field. The pattern made on the grass by the sun shining through the transparent red UltraCote is truly amazing.

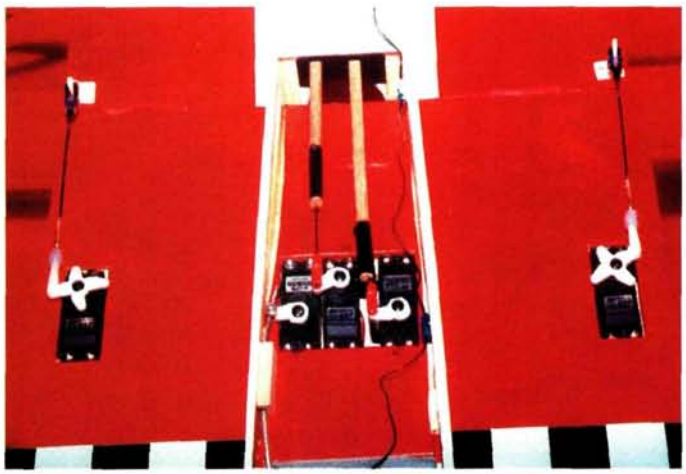
AEROBATICS

With the controls set at a high rate, aileron rolls are axial and snappy. With the elevator set at a low rate, loops are predictable and can be performed with ease. At a high rate of elevator and ⅔ throttle, they are instantaneous. A series of loops at high rate and ⅔ throttle are true, with no bleed-off in speed. They become so tight that at times, I'm afraid I might cut off my own tail feathers. With the proper rudder throws, spins are fun. This plane is capable of performing every maneuver I can input on the sticks—and then some.

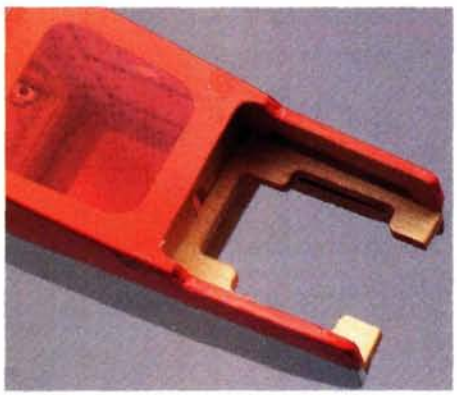
a breeze. I had plenty of room up front. Using the supplied hardware, which included aluminum engine-mounting rails, the engine was in place in record time. I installed the prop and spinner later.

Radio gear and control surfaces. I wrapped my JR R600 FM receiver in foam and installed my servos three abreast on the servo platform. I then wrapped the battery in foam and tucked it up against the firewall. Next, I installed the switch.

The tail surfaces are controlled by pushrods made from wooden dowels with threaded rods on each end. Attach the threaded rods to the wooden dowels by drilling a 3/32-inch hole in the dowel and making an L-bend in the rod. I wrapped the assembly with nylon thread and epoxied it. After the epoxy had dried, I slid a piece of heat-shrink tubing over the joint and shrank it in place.

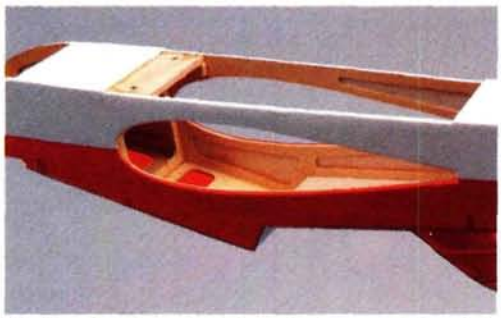


All the servos for the model are installed in the thick wing. As you can see, you have excellent access to everything.



The engine compartment comes ready for you to drop in your favorite engine.

I routed the antenna out of the rear of the hatch and secured it to the underside of the airplane. The landing gear and equipment hatch are held in place with one set of bolts that are first threaded through the landing gear and then through the predrilled holes in the hatch. They're held in place by the pre-installed blind nuts. I installed the large canopy using Pacer 500 glue and the supplied screws.



The fuselage is a sturdy box structure, and the wing slides right into place. Note the ample hatch opening in the fuselage belly.

Want a good-quality, fun-flying airplane? Look no further. The Pizazz is a model that's strong, lightweight and easy to assemble. But more than anything else, you will be impressed by its outstanding performance. Pick one up and see for yourself. ✈

Hangar 9; *distributed by Horizon Hobby.*

Horizon Hobby Inc. *(800) 338-4639; horizonhobby.com.*

JR; *distributed by Horizon Hobby.*

Master Airscrew; *distributed by Windsor Propeller Co. (916) 631-8385; masterairscrew.com.*

Pacer Technology *(800) 538-3091; pacertechnology.com.*

Saito; *distributed by Horizon Hobby.*

UltraCote; *distributed by Horizon Hobby.*

MRC/Altech

EZ Dago Red

Quick-build Reno Racer

PHOTOS BY CRAIG TRACHTEN & WALTER SIOAS

by Craig Trachten

Nothing is more exciting than the sound of a Merlin Rolls-Royce engine and the phrase, "Gentlemen, we have a race!" Since 1982, Dago Red has been setting racing records and standards that have yet to be matched.

Distributed by MRC/Altech, the EZ line of ARF (almost-ready-to-fly) models has also been setting high standards with planes that are quick to build, look great and fly even better. I have never been disappointed with the construction or performance of an EZ airplane, and the Dago Red that I recently built is no exception.

SPECIFICATIONS

MODEL: Dago Red

MANUFACTURER: OK Models Ltd.

DISTRIBUTOR: MRC/Altech

TYPE: sport-scale ARF

WINGSPAN: 54.7 in.

WING AREA: 532 sq. in.

WEIGHT: 6.56 lb.

WING LOADING: 28.3 oz./sq. ft.

LENGTH: 46.4 in.

ENGINE REQ'D: .40 to .50 2-stroke to .70 to .80 4-stroke

ENGINE USED: Enya .80 4-stroke

PROP USED: APC 13x6

RADIO REQ'D: 5-channel with 6 servos (2 ailerons, elevator, rudder, throttle, retracts)

RADIO USED: Futaba T6XA with 5 Futaba and 1 OK Models EZ-retract servo

FUEL USED: Wildcat 30% nitro heli

PRICE: $300

FEATURES: lite-ply and balsa airframe construction covered with a laminated skin made from a plastic-foam base, a synthetic paper layer with graphics and a layer of clear Mylar; retractable landing gear; chrome-plated plastic spinner; vacuum-formed plastic cowl.

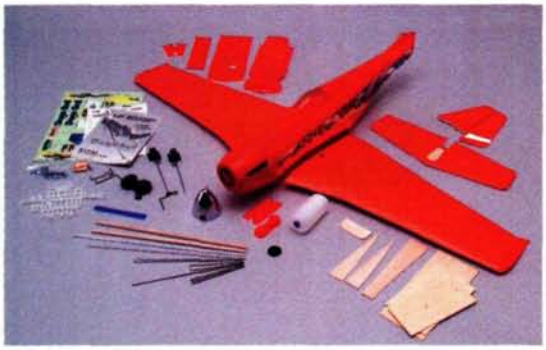
COMMENTS: once again, OK Models hits a grand slam with the Dago Red. This ARF is top-shelf in the way it's built and for the materials used, and its flight performance is crisp and solid. Flying mock Reno Races at the field is very exciting.

HITS

- High-quality materials used throughout.
- Great parts fit.
- Retractable landing gear included.

MISSES

- Instruction manual could provide more written information.



The Dago is a very sharp-looking model that doesn't take a lot of time to get into the air. The wild flame graphics on the fuselage are factory-applied and match those on the full-scale Dago.

IN THE BOX

When you open the box, you'll be amazed at the contents; ARFs just don't get any better than this! The fit and finish of the parts are nothing short of perfect. All the hardware (metric), retractable landing gear, wheels, chrome spinner, fuel tank, instruction manual and stunning decals are included. I needed to add only a radio system with six servos, an engine and glue.

OK Models developed the EZ construction that consists of a plastic-foam base and a lite-ply and balsa frame. The unique feature of this construction is that the colors and graphics are bonded to the foamboard, and they are protected by Mylar. The instruction manual contains a lot of assembly photos but not much in the way of detailed instructions; in this case, more written information would have been better.

Wing assembly. Construction begins with the installation of an aileron servo in each wing panel, and you'll need two 6-inch extensions so the plugs can reach the center of the wing. To prevent the extensions from disconnecting during flight, I shrink-wrapped them for peace of mind. I mounted the servos as instructed and used Futaba's S9150 low-profile digital aileron servos; they fit completely under the cover plate, and only the output shaft and servo arm were visible. This gives the wing a nice, clean, finished look. I made the aileron pushrods and attached them to the servo arms with an L-bend and quick links, and I used the supplied clevises on the ailerons.

The included retractable landing gear is installed next. Open the compartment in the left wing half to accommodate the retract servo; the wheel wells are already in the wing. I assembled the servo mount and then installed an EZ R-7401 Super Retract servo in it before I glued the mount into the compartment. This ensures the proper servo height so it can be mated with the gear's pushrods. I bent the retract pushrods to the specified length and attached them to the retracts before I slid them into each wing half. The manual shows that the retracts should be screwed down at this point; I did this later to make it easier to hook up the pushrods. I'll explain later.

Next, I epoxied the center ribs to each wing half and laminated the three-piece wing joiner together. The manual suggests that you use CA for this, but I recommend epoxy for this critical joint. When the epoxy had cured, I joined the wing halves with plenty of epoxy.

After the wing has been joined, the retractable landing gear is hooked up to the servo. The instructions show the retract

The kit includes covers for the landing legs, and they dress up the model nicely. To avoid exposed aileron servos, I used Futaba low-profile servos that fit inside the wing.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

On a prepared surface, taxiing was a pleasure, and there were no bad tendencies (ground looping). On my grass field, taxiing the Mustang was a little more difficult because of its small main

wheels. With an Enya .80 up front, takeoffs happened quickly; I held full up-elevator and slowly added throttle. As the aircraft built up speed, I neutralized the elevator, and on rotation, slight right rudder was needed. The Dago has a long tail moment and requires less rudder than you might expect, so don't over-control it.

Because the Dago is so very solid at slower speeds, landing it is a non-event; you need only manage the throttle to slow it down. To prevent the model from nosing over, on a grass runway, a 3-point landing is preferred. After the flight-testing had been completed, I opened up the plastic wheel wells and installed larger, 3-inch-diameter wheels.

LOW-SPEED PERFORMANCE

The slow flight envelope is not what you would expect from this type of plane. Like the other OK Models, the Dago has tremendous slow-speed characteristics. No, it isn't a trainer, but it's extremely stable and responsive at landing speeds; "well-behaved" sums it up nicely.

HIGH-SPEED PERFORMANCE

With the Enya .80, the Dago is at the upper end of the weight limits and is definitely over-powered, but what a combination! This aircraft was born to fly fast. With its somewhat thin airfoil, this model slices cleanly through the air. Control response is razor-sharp and accurate, so be sure to use the recommended control throws.

AEROBATICS

The Enya produces so much horsepower that aerobatics are anything but scale-like, but they are heaps of fun. Loops can be as large or as tight as you choose; the Dago tracks effortlessly. Rolls are drill-like and axial and hardly any down-elevator is needed through the inverted portion (not that you'll have any time to make the control input). Inverted flight is much the same as upright flight. The large rudder makes knife-edge flight a cinch.

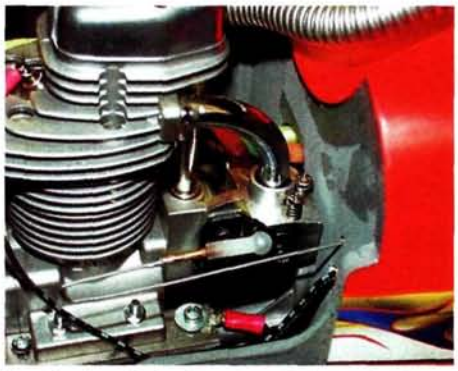
pushrods attached to the servo but give no details on how to do it. I couldn't see how the pushrod Z-bends could be inserted from the top side once the wing had been assembled.

Remember that I didn't screw the retracts into place earlier in the assembly? Here's why: the retracts must be removed from the mounting area and pushed toward the center of the wing so you will have enough pushrod length to work with. Next, I rotated the right retract pushrod so that it entered the servo horn from the bottom. I then oriented the horn front to back, inserted the Z-bends on each side and rotated the horn side to side. I made a little bend in the left pushrod so that it would clear the servo output shaft when the retracts are cycled.

The last step is to assemble and install the wing hold-down block and wing bolt plate. I left the wing bottom cover off the bottom plate. It isn't needed structurally, and it's a lot easier to line up the wing bolts and the mounting holes with it off.

Engine installation. Because I had a new Enya .80 4-stroke looking for a home, I called Altech and asked Jeff Green about mounting it in the Dago. Jeff told me that the engine would fit but that I would need to modify the engine mount.

To accommodate the carburetor, I ground out a recess in the top left corner of the mount (with the engine in the upright position). A sanding drum on my Dremel Moto-Tool made short work of this task. The next problem was the throttle linkage; the carburetor was too close to the firewall for a typical pushrod installation. I used a length of piano wire that went beyond the throttle arm, made a 180-degree bend in the wire and attached it to the throttle arm with a ball-cup connector.



For the throttle hookup, I used piano wire for the pushrod and bent it 180 degrees to reach the throttle arm. The cup-and-ball connector resolves any alignment problems.

This is one of the easiest cowls to work with. It's trimmed to size and fits perfectly.

Stabilizer assembly. One thing I especially like about this kit is the internal elevator pushrod; it's set up similar to torque-rod-activated ailerons. The innermost hinge on each elevator is a torque bearing, and the pushrod is attached to the torque rods using the supplied ball link. First, I epoxied the stabilizer mount to the horizontal stabilizer and made sure that I centered the torque rods in the plate's opening. I then epoxied the vertical fin to the horizontal stabilizer and made sure it stayed perpendicular while the glue cured. I also ran a fillet of epoxy around the vertical fin for extra security, hinged the rudder to the vertical fin, attached the horn and hooked up the pushrods. Both pushrods are assembled from wood dowel and music wire (which work fine), but I decided to swap them out for Dave Brown's fiberglass pushrods.

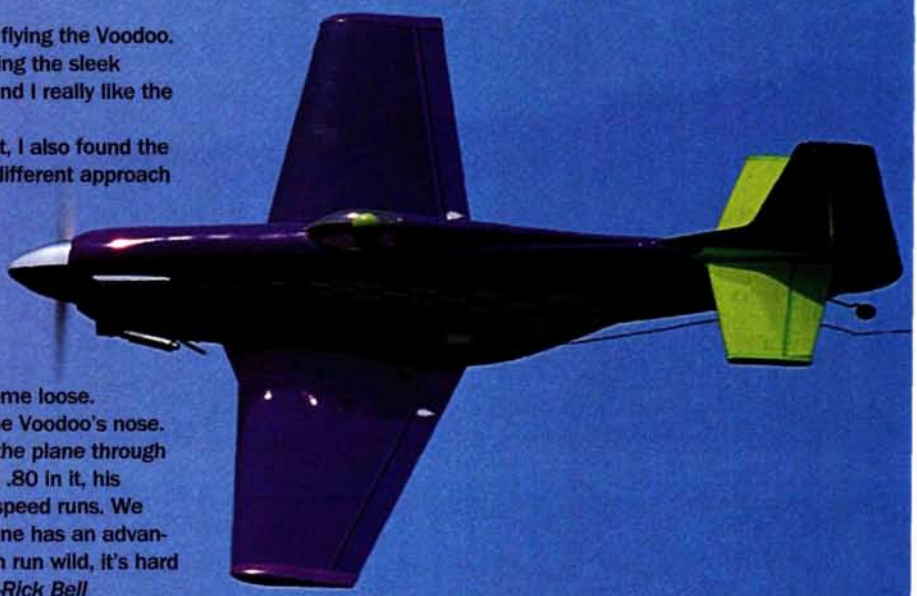
A STABLE OF MUSTANGS

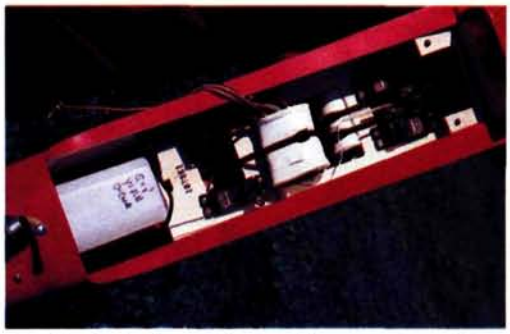
As a companion to the Dago Red, OK Models Ltd. also offers the Voodoo. The models are virtually the same except for the Hornier-style wingtips on the Dago, and, of course, the wild purple and highly visible, lime-green paint scheme on the Voodoo.

As a big Mustang fan, I really enjoyed building and flying the Voodoo. OK Models Ltd. has done an exceptional job of capturing the sleek racing lines of these thoroughbred racing machines, and I really like the Voodoo's exquisite graphics.

Although I didn't have any problems building the kit, I also found the pushrod installation for the retracts difficult. I used a different approach from Craig's to ease their assembly and maintenance. Instead of using the pushrod Z-bends at the retract servo, I used Great Planes Screw-Lock Connectors to attach the pushrods to the servo wheel. This enabled me to join the wing halves and then install the retracts and adjust them. I've used these connectors for a few years now on mechanical retracts and have never had one fail or come loose.

I installed a Saito .72 4-stroke, and it fit easily in the Voodoo's nose. The engine supplies more than enough power to pull the plane through any maneuver. Even though Craig's Dago has an Enya .80 in it, his plane and mine are very evenly matched during high-speed runs. We have had a blast racing the Mustangs, and neither plane has an advantage over the other. If you want to let your imagination run wild, it's hard to beat these Mustangs for unbridled performance! —*Rick Bell*





There's plenty of room in the radio compartment for the components. I used nylon zip-ties to secure the receiver and battery.

Cowl assembly. The cowl's upper portion is part of the one-piece, plastic top plate of the fuselage. The lower portion is U-shaped, and this design makes it extremely easy to mark, cut and fit the cowl. Dummy exhaust stacks that fit between the upper and lower cowl are supplied; I painted them with Alclad's chrome lacquer which makes the stacks almost look chrome plated. I used Pactra Formula U clear polyurethane to *fuelproof* the stacks.

Finishing touches. A two-piece vacuum-formed pilot bust comes with the kit, but since I haven't ever been able to make a two-piece bust look good I commandeered a bust from a William Riker action figure. I attached the canopy with JZ's R/C Z56 canopy glue and then trimmed it with the supplied stickers. I added the included decals, balanced it and double-checked the control throws. I was ready to go flying!

Conclusion. OK Model's Dago Red is an accurate rendition of a famous Reno Racer; the printed-on graphics are just stunning. The plane goes together quickly, and with the Enya .80 up front, it flies as a racer should—fast! I wish that the instructions had been clearer in some areas and that the retractable landing-gear pushrods weren't so tricky to install, but if you're looking for a unique Reno Racer, look no further than the Dago Red. Gentlemen, we have a race!

***Alclad II** (813) 643-1232; alclad2.com.*

***APC Props;** distributed by Landing Products (530) 661-0399; apcprop.com.*

***Dave Brown Products Inc.** (513) 738-1576; dbproducts.com.*

***Enya;** distributed by MRC/Altech.*

***Futaba Corp. of America;** distributed by Great Planes Model Distributors Co.; futaba-rc.com,*

***Great Planes Model Distributors Co.** (800) 637-7600; greatplanes.com.*

***J&Z Products Inc.** (301) 539-2313.*

***MRC/Altech** (732) 225-6144; modelrectifier.com.*

***OK Model Ltd.;** distributed by MRC/Altech.*

***Pactra Inc.** (815) 962-6645.*

***Saito;** distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

***Wildcat Fuels** (606) 885-5619; wildcatfuel.com.*

VMAR Texan II

The Texan lives on!

PHOTOS BY CRAIG TRACHTEN & WALTER SIDAS

by Craig Trachten

The North American AT-6 Texan is probably the best-known primary trainer of the WW II era. Raytheon Aircraft in Wichita, KS, is manufacturing the next generation of trainer: the Texan II. Since winning the Joint Primary Aircraft Training System fly-off, the Texan II has been ordered by the U.S. Air Force, the U.S. Navy and several NATO nations to replace their rapidly aging trainers. Using authorized drawings, VMAR brings us this sharp-looking military trainer in two sizes (.45 to .60 and .90 to 1.20) and two trim schemes (USAF and Canadian Harvard) for a choice of four models. The .45 to .60 USAF model is the subject of this review.

KIT CONTENTS

After I opened the box, I double-checked my cash-register receipt; I thought a mistake had been made. There is no way this aircraft could be so inexpensive! VMAR ARFs are certainly setting a new benchmark for quality and value. Items such as a finished cockpit tub that's fully detailed with instrument panels and painted pilots and landing gear with scale-looking struts are just two examples. Other kit features include a painted fiberglass cowl with scale exhaust stacks, an aluminum engine mount, a universal servo tray, spinner, wheels, fuel tank, a complete hardware package and assembly manual. By the way, the pilots have cloth shoulder harnesses—a very nice touch!

Building this kit was as easy as it gets. The woodworking was excellent, the Sure Seal covering has panel lines and other details bonded in, and the control surfaces are attached at the factory. The assembly manual is better than most, but the construction photos were fuzzy. Sharper photos would clarify some of the construction details.

SPECIFICATIONS

MODEL: Texan II

MANUFACTURER: VMAR

DISTRIBUTOR: Richmond RC Supply Ltd.

TYPE: semi-scale military trainer

LENGTH: 50 in.

WINGSPAN: 57¾ in.

WING AREA: 540 sq. in.

WEIGHT: 7 lb.

WING LOADING: 29.87 oz./sq. ft.

ENGINE REQ'D: .46 to .60 2-stroke or .53 to .70 4-stroke

ENGINE USED: O.S. .70 Surpass 4-stroke

PROP USED: APC 13x6

CHANNELS REQ'D: 4 (aileron, elevator, rudder, throttle)

RADIO USED: Futaba 8UAPS w/4 servos

FUEL: Wildcat 30% heli

PRICE: $149.95

FEATURES: all wood construction; fiberglass cowl; power module system; aluminum engine mount; pinned hinges; factory-installed metal pushrods; scale landing gear; scale cockpit; full hardware package; photo-illustrated instruction manual.

COMMENTS: from the materials used to the detail of the graphics and the overall design features, VMAR has hit the nail on the head with the Texan II. Top it off with the detailed cockpit that includes painted pilots, and you have an airplane that is a joy to build and fly.

HITS
- High-quality materials.
- Fast, easy assembly.
- Power Module system.
- Scale details.

MISSES
- Fuzzy construction photos.

The Texan II sits on the tarmac awaiting its next training mission. Pretty sharp-looking model!

ASSEMBLY

Wing. Construction begins with the wing, and a great feature is the use of alignment dowels near the leading and trailing edges; this guarantees a well-aligned wing. I test-fit the wing joiner and alignment dowels in each wing half; some minor sanding was necessary to achieve a proper fit. I marked the center of the joiner and dowels and then epoxied them into a wing half. While this was curing, I wrapped some ¾-inch-wide masking tape around each wing root as an "ooze guard." Any epoxy that oozes from the joint will remain on the tape and be peeled away with it. I applied a healthy coat of epoxy on each root plate and in the joiner and dowel holes and then slid the wing halves together. I used tape to hold the wing halves together until the epoxy had cured.

The aileron servo and control rods are a snap to install. The servo mount is part of the wing, and you need only open the mounting hole to fit your servo. I used a standard-size Airtronics servo, and I only had to cut a notch for the servo wire to exit. The pushrods are factory-assembled with clevises at both ends; I only had to adjust their length before I attached them. I find that most kit-supplied clevises are acceptable, but these are excellent! Unlike other clevises, these use a machine screw to hold them closed—not a snap pin that could pop open.

To finish the wing, I removed the covering from the hardwood landing-gear blocks and installed the gear with the supplied straps and screws. On my model, the gear legs were a tight fit in the hardwood blocks. Each landing-gear leg has scale-looking covers installed, so make sure that you mount the correct leg in the correct wing panel. Install the wheels, and lock them into place with the included wheel collars; then the wing is complete.

Fuselage. VMAR employs a unique and ingenious system to mount the engine, fuel tank and nose gear in what it calls the "Power Module." It's unique because you mount the nose gear, fuel-tank assembly and engine on the firewall, which is removable from the fuselage. This comprises the Power Module, which is then slid into the nose of the fuselage. Four studs on the front bulkhead mate with the firewall, and the module is secured to the fuselage with nuts and washers. Need to perform some maintenance on the fuel tank? Just remove the nuts, and slide the module out. Pretty slick! Be sure to use some thread-locking compound on the nuts; you don't want them to loosen during flight.

Start by marking the holes for the engine mount. The thrust lines are already marked on the firewall. I temporarily attached my O.S. .70 4-stroke to the mount, then marked and drilled the holes.

Above: the included servo tray is molded of plastic and has fixed mounting holes on one end. The other end is adjustable to fit any standard-size servo. The tray screws into the fuselage for easy servicing. Right: the module is mounted on studs that protrude from the front bulkhead. Nuts and washers hold it in place. Note that you can easily adjust the thrust angles by inserting a few washers in between the back side of the firewall and the nuts on the studs.

FLIGHT PERFORMANCE

TAKEOFF AND LANDING

Although the O.S. .70 Surpass can get the Texan off the ground in a big hurry, I like to do scale-like takeoffs. I slowly add throttle and elevator until the plane rotates. For best effect, I like to use most of the runway. Very little right rudder is needed to keep the Texan on track, and on rotation, the Texan climbs out smoothly. Landings are smooth and scale-like; I can grease 'em in, landing after landing, using throttle to control the descent and aileron to keep the wing level.

LOW-SPEED PERFORMANCE

Just like its big brother, the Texan II is an excellent first low-wing trainer. It handles extremely well at just above stall speed, which is quite slow. When the aircraft does stall, the nose and left wing will drop, but not violently. A blip of the throttle and a correction on the sticks bring the aircraft back under control. Scale fly-bys look really pretty.

HIGH-SPEED PERFORMANCE

With the O.S. Surpass, the Texan will eat up sky in a hurry. No trim changes are required between low and high speeds, though, and this speaks well of the plane's alignment. I would not recommend exceeding the suggested high-rate control settings, as the controls are very effective.

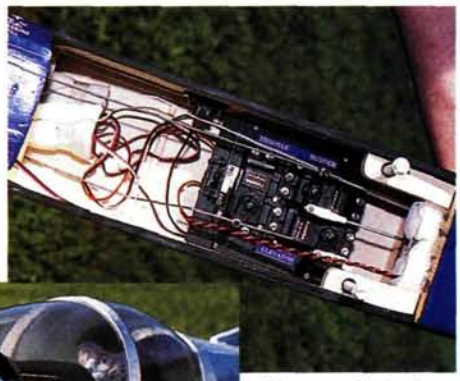
AEROBATICS

Rolls are very rapid on high rates, and axial loops are symmetrical and tight without any drop-off or snapping tendencies. I tried very hard, but I couldn't high-speed stall the Texan—not something you'd expect from a semi-scale military trainer. Flying inverted is not much different from flying right-side up, and not much down-elevator is needed to hold level flight. Knife-edge flight is easily achieved by holding a little rudder; I could fly the plane on its side from horizon to horizon. This model makes me look like a better pilot than I am. The military won't be disappointed with its trainer!

I decided to mount the engine upright instead of using the inverted installation shown. This was no big deal; just a little extra work was needed to mount the cowl.

The fuel tank is assembled in the usual manner, and I used a 3-line fuel system. I also used different colors for each line; no mixing up the fuel lines for me! The tank is secured to the back side of the firewall with rubber bands attached to mounting dowels. I chose instead to use electrical tape to hold the tank in place.

I installed the nose gear in the factory-installed bracket; the gear is held in place by the steering arm. Before you place the nosewheel steering arm on the gear, insert the steering control rod through the firewall and into the steering arm; it will be impossible to get the Z-bend on the arm once it's installed on the gear leg. The Power Module is now complete and can be mounted on the fuselage.



Above: no lack of space in here. You install the servo tray after you mount the servos on it. The pushrods are installed at the factory and require very little adjustment for the servos you'll use. I mounted the battery behind the servos to minimize the weight needed to balance the model. Left: this is how the cockpit comes finished, right out of the box. The instrument panels, pilot busts and canopy are painted and mounted on the fuselage.

Radio tray. The radio tray is removable for easy installation and maintenance of your servos. What makes mounting easy is that the plastic servo tray has fixed mounting holes on one side and adjustable sliders on the other. No cutting or sanding was needed to properly fit my Futaba S148 servos. The tray is then installed in the radio compartment with four screws that can easily be removed when it's time to perform routine maintenance.

Empennage. Installing the horizontal and vertical stabilizers is so simple that there is little to say about it. Both of them have built-in slots and tabs that mate with the fuselage and make it virtually impossible not to get a perfect fit. I attached the control horns to the elevator and rudder and then clipped them onto the factory-installed metal pushrods.

Final touches. Finish construction by mounting the cowl and securing the dorsal fin to the top of the fuselage and to the vertical fin. No effort is needed to install the canopy. You guessed it; not only was it factory-installed, but the pilots and instrument panels were, too—a tremendous timesaver!

Following the manual, I set up the control throws and balanced the model. With the O.S. Surpass up front, I needed to add 1 ounce of lead to the tail to make the Texan balance perfectly. When all was set, the Texan II was ready to go!

SUMMING IT UP

A great deal of time and effort have been put into the design of the VMAR Texan II to minimize assembly time, and it shows. It took me about 4½ hours from the time I opened the box to be flight-ready. The scale details such as the finished, detailed cockpit and panel lines really make the model stand out on the flightline. But for me, the best part is the way the Texan flies—very solid and predictable. I guess that's why the U.S. military chose it as its next generation of trainer.

Airtronics (714) 978-1895; airtronics.net.
APC Props; distributed by Landing Products (530) 661-0399; apcprop.com.
Futaba; distributed by Great Planes; futaba-rc.com.
Great Planes Model Distributors (800) 637-7660; greatplanes.com.
O.S. Engines; distributed by Great Planes; osengines.com.
VMAR; distributed by Richmond RC Supply Ltd. (877) 727-2329; richmondrc.com.
Wildcat Fuels (606) 885-5619; wildcatfuel.com.

Hacker Sky Arrow

Popular Italian design goes electric

by Bob Van Tassel

The Sky Arrow awaits another exciting flight. The full-scale aircraft is a popular recreational plane in Europe.

The Sky Arrow is a lightweight Italian sport plane that's available in kit form and sells for about $80,000. The full-size Model 650 uses carbon fiber in its components, seats two in tandem and has exceptional visibility and stability. After researching the Sky Arrow and comparing pictures of the real plane with the model, I was very impressed by how detailed Hacker has made its Sky Arrow.

SPECIFICATIONS

MANUFACTURER: Hacker

MODEL: Sky Arrow

DISTRIBUTOR: Sig Mfg.

TYPE: sport-scale electric ARF

WINGSPAN: 41¾ in.

WING AREA: 1.95 sq. ft.

LENGTH: 30 in.

WEIGHT: 21 oz., ready to fly

WING LOADING: 10.76 oz./sq. ft.

POWER REQ'D: Speed 280 or Speed 400 motor

DRIVE SYSTEM USED: Speed 400 motor with Castle Creations Pixie 20 ESC and Graupner 6.5x4 prop

RADIO REQ'D: 4-channel w/3 microservos (elevator, rudder, ESC and ailerons)

RADIO USED: Futaba T6XA transmitter w/GWS SR4 PHF receiver and 3 microservos (elevator and 2 ailerons)

BATTERY USED: 7-cell, 500mAh Ni-Cd

PRICE: $149.99

FEATURES: lightweight built-up balsa wings; fiberglass fuselage; polyester covering; molded-plastic engine cowl; detailed decals.

COMMENTS: what a sweet-looking work of art this plane is! It reminds me of a modern, stretched-out version of the early 1950s Republic "Seabee." "Sky Arrow" is an appropriate name for this airplane because its profile looks like an arrow in flight. It's a novel entry in the lightweight sport-plane category, and it's a real crowd-pleaser. It's also easy to assemble and flies great!

HITS

- Well constructed.
- Fast assembly.
- Well-fitting parts.

MISSES

- Challenging instructions.
- Some distortion of the fiberglass fin.

KIT CONTENTS

When the kit arrived, the box was so light that I thought it was empty! When I opened the package, however, I was pleasantly surprised to find the kit complete in every aspect and without any wrinkles in the film covering. I inspected the gelcoated fiberglass fuselage and found its finish flawless, but the vertical fin was slightly warped. I was so astonished by how light the components were that I had to weigh them. The fuselage weighed 3.5 ounces, and the wing weighed 2.5 ounces. The basic components weighed only 9.5 ounces.

The instructions consist of a single sheet with an exploded diagram of the plane; most of the written instructions are in foreign languages with English subtitles. Sig says it is in the process of revising the instructions. With a little effort, however, even a novice should be able to assemble the plane using the exploded-view diagram.

I decided to build the Sky Arrow without rudder control and sacrifice some aerobatic capability. To install rudder control would have been difficult under any circumstance, but with the warp in the fin, it would have been extremely challenging.

ASSEMBLY

Wing. I began by attaching the aileron servos to the aileron hatch covers with double-sided tape and cutting slots in the hatch covers for the servo arms. I used a sharp hobby knife to remove the covering over the servo pocket. I then checked the servo movement to make sure that I had the correct direction for aileron movement. I next cut a slot in the fuselage for the aileron servo leads in the area where the root rib is attached to the fuselage, and I made sure that the servo leads were long enough to reach a Y-connector in the fuselage. I cut small slots in the ailerons for the aileron horns and secured them with medium CA. I attached the servos to the horns with the supplied wire pushrods.

The wings are aligned with the upper fuselage by a metal rod in the center of the airfoil and a wooden dowel at the trailing edge; this sets the correct dihedral angle. I lightly sanded the root ribs and the fuselage where the wing is attached to it. I used a little 5-minute epoxy to glue the wing to the fuselage, then covered the joint with white electrical tape and ended up with a smooth, clean transition.

Tail feathers. The Sky Arrow's stabilizer is mounted on top of the vertical fin for a T-tail configuration. This, along with the high pusher prop, gives good airflow over the stabilizer. The stabilizer comes with the elevator already hinged to it, and the

PHOTOS BY WALTER SIDAS

FLIGHT PERFORMANCE

Since I do all of my flying off a grass field, I've made no attempt to ROG; instead, I hand-launch all flights. Before the first flight, I ground-checked all systems with the motor running and found no radio interference. There was a slight breeze of about 10mph.

TAKEOFF AND LANDING

I take about two steps forward with the plane held high and level, open my hand and release the Arrow. It flies straight out of my hand into the breeze and is 50 feet high in a matter of seconds.

I like to land the Sky Arrow by allowing the battery to run down and the motor to produce fewer rpm. Doing this, of course, means you get only one shot at landing. The plane has a very good glide, and by cutting the motor on final, you always have a little power to stretch the landing. The Sky Arrow glides slowly and gently. I usually allow it to just float into the grass runway; no final flare is necessary. Landing is gentle, and there's no danger of breaking the pusher prop.

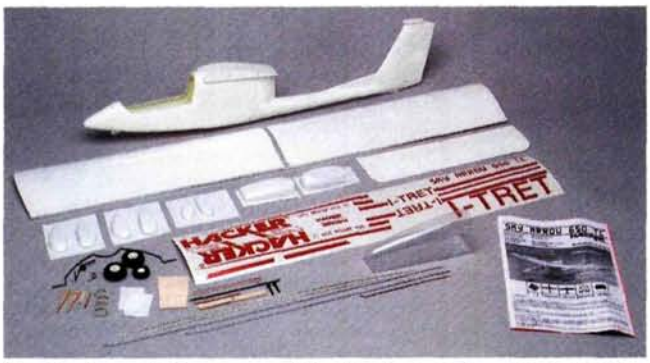
GENERAL PERFORMANCE

The controls are very responsive. The plane performs nimbly, but it gets pushed sideways when it flies in a crosswind. The Sky Arrow performs best in very light wind.

With the light wing loading, the Sky Arrow can be slowed to a crawl, but attempts to stall it have proved fruitless. This plane was not designed for high-speed flight.

AEROBATICS

The Sky Arrow is a replica of a lightweight sport plane and is best suited for gentle, slow flying. It performs large loops, and it can be coaxed into gentle rolls. Flying this plane would be an excellent introduction to electric flight.



The Sky Arrow kit is very complete. The fuselage is molded of lightweight fiberglass; it's very strong, and it weighs only a few ounces. The wings and stabilizer are built of balsa and are nicely covered.

assembly is attached to the fin with two machine screws. I cut a slot in the elevator for the control horn and glued it into place with a dab of medium CA. I mounted the miniservo for the elevator on servo rails that are attached to the inside of the fuselage in the cockpit area. The elevator pushrod is a lightweight, flexible metal rod that's encased in plastic. To minimize the pushrod flexing, I secured it to the inside of the fuselage with a small block of foam. Since I fly from a grass field and hand-launch the model, there was no need for nosewheel steering, so I centered it and glued it into place. Using white spray paint from a hardware store, I sprayed the landing-gear wire to match the plane. Fuelproofing isn't necessary.

The Sky Arrow's pusher configuration provides unobstructed airflow over the stabilizer for excellent control. It's highly unlikely that you'll break the prop in a crash—another advantage of the high-mounted pusher arrangement.

Landing gear. I cut the wheel-pant halves from the lightweight vacuum-formed plastic and left a small lip on them to give the medium CA glue something to grip. After the glue had set, I removed most of the lip. I next drilled a hole in the wheel pants for the landing-gear wire and secured them with small plastic straps cut from the supplied vacuum-formed plastic. I had to look carefully to identify these pieces; they are not marked and could easily be thrown away. The gear is then glued into place with CA, and I covered the slot with white electrical tape to conceal it.

Motor mount and final assembly. I measured the motor for clearance at the trailing edge of the wing and then glued the two motor mounts to the top of the wing. To prevent the motor from moving toward the front of the plane, I installed a motor stop block. To allow the motor wires to enter the fuselage, I drilled a hole and wired the motor for the pusher prop. The clamshell cowl comes in two pieces and must be trimmed. I cut a large hole in the cowl to allow the motor shaft to exit, and I also cut a lower portion of the cowl to allow it to fit over the motor. After I trial-fit the cowl, I glued it to the wing. To allow access to the motor, I used trim tape to hold the cowl halves together. I next mounted the receiver to the inside of the fuselage with hook-and-loop fastener and tucked the flight battery up into the nose of the fuselage.

The plane has a very large clear canopy that allows a view of the radio equipment and wiring. To improve the plane's looks and conceal the workings, I sprayed the canopy with a light coat of metallic blue paint. A few small pieces of plastic tape work well to hold the canopy in place. I did a final check of the model, charged the batteries and was ready and eager to fly it.

CONCLUSION

The Hacker Sky Arrow is a neat-looking model that's easy to assemble. Its lightweight airframe contributes to its wonderful flight performance. The high-mounted pusher-prop configuration protects the prop in case of a mishap. I have lots of fun flying this unique Italian sport plane. ✈

***Castle Creations** (913) 438-6325; castlerc.com.*
***Graupner;** distributed by Hobby Lobby Intl. (615) 373-1444; graupner.com.*
***Hacker;** distributed by Sig Mfg.*
***Sig Mfg. Co. Inc.** (800) 247-5008; sigmfg.com.*

Make Spoked Wheels

The easy way to make strong, light wheels out of inexpensive materials

by Bertil Klintbom

I've been making spoked wheels for my WW I models for many years, and I have found an easy, inexpensive method. The wheels I make are tough and can stand up to lots of abuse, and you can make them in any scale size you need. Let's get started.

DESIGN

In the early days of aviation, spoked wheels were made in a variety of ways. The spokes extended directly from the hub out to the rim, or they were angled to produce a crossed-spoke effect (similar to that of a motorcycle wheel). My method produces a radial-spoke wheel; you can easily produce it in several styles by repositioning the hub flanges.

If you don't have a scale outline of the wheel you want to replicate, just draw a circle of the appropriate size, and mark the positions of the rim and the hub flange. The rim should be 4x0.4mm thick for wheels of up to 100mm in diameter and 3x0.7mm for wheels of more than 100mm in diameter. The number of spokes on full-size aircraft varied with manufacturer, but if you want to be accurate, look for information on your plane on the Internet and in other scale resources.

I suggest that you start with 36 spokes and the "lacing" method; each hole in the hub flange serves two spokes. I drilled nine holes in the flange spaced about 40 degrees apart.

• **Rims.** The rims are made of laminated layers of thin plywood formed around a round object of a suitable-size; try to find a suitable jar or make a round wooden former on a lathe. Cut the plywood rim strips a little longer than needed to allow for the glue joints. For a 100mm-diameter wheel, the rim strips should be about 12mm wide. Wrap the first strip around the former and overlap and glue the ends together. After the glue has dried, chamfer (feather) the joint to make it smooth. Proceed with the other layers, and be sure to position the joints at different places around the rim; sand smooth.

Cut narrow strips of 0.4mm-thick plywood (three layers for each side of the rim), and glue them into place to create a U-shaped section to help retain the tire. When everything has dried, sand the outside of the rim to shape while it is still on the former. I use a Dremel Moto-Tool and a sanding drum for the first rough shaping, and then I finish sanding by hand. When you have a smooth surface, remove the rim from the former and finish its inside.

Now drill the holes in the rim for the spokes. Start by cutting a strip of thin card stock that's 10mm longer than the rim's circumference. Wrap it around the rim and mark the rim's circumference on it. Then mark it for 36 evenly spaced holes. Keep in mind that the two ends will be overlapped and will share a hole, so you should mark 37 holes to end up with 36. Stagger your marks so that the first hole is on the left side of the rim and the second

YOU'LL NEED

- Sharp hobby knife
- Sanding paper
- Metal wire cutter
- Solder/soldering iron
- Electric drill
- Brass tube
- Two 15- to 20mm-diameter brass discs (washers)

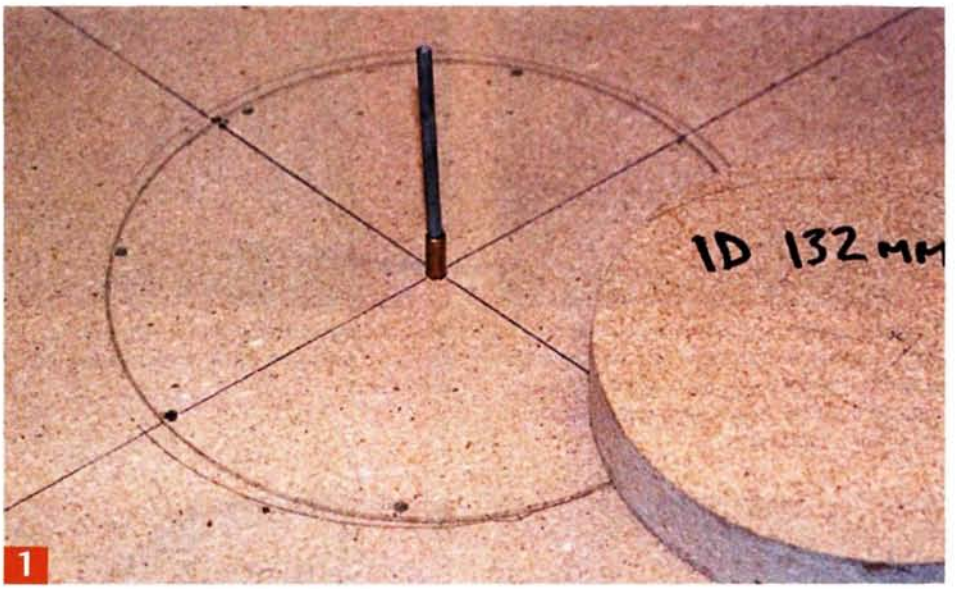
WHEEL DIAMETER	RIM MATERIAL	SPOKES	HUB MATERIAL	TIRE MATERIAL
Up to 100mm	0.4mm-thick plywood	0.5mm nylon fishing line	0.5mm brass tube	Foam or tube
Larger than 100mm	0.7mm-thick plywood	0.7mm nylon fishing line	0.5mm brass tube	Foam or tube
ADHESIVES	White glue	CA glue		Epoxy

on the right, and so on. When you've measured and marked the card strip accurately, wrap it around the rim again and drill the holes through the rim where marked with a small drill bit. Clean the holes in the rim with sandpaper and then paint the rim.

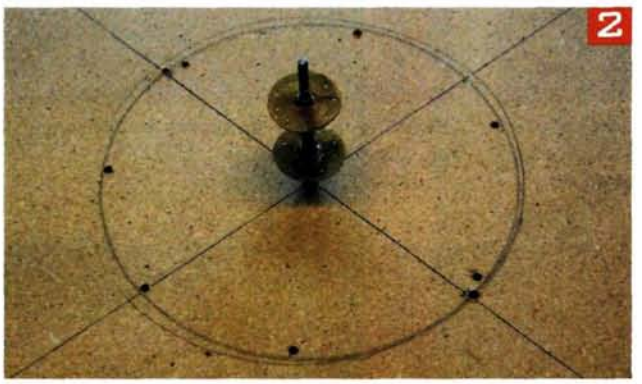
• **Hub.** Make the hub out of a piece of brass tube with a 15- to 20mm-diameter brass washer soldered to both ends. Before you solder the washers on, mark nine equidistant points on each one, drill a hole at each mark, and sand away any burrs. Then solder the washers to the brass tube in such a way that the holes are staggered by about 10 degrees to get the correct lacing pattern (see photo 2).

• **Alignment jig.** Make the jig out of a piece of plywood or chipboard. Draw the rim's exact inside diameter on the jig's base, and drill a hole for the axle guide wire and six to eight other holes so they are just inside the rim circle. Cut the alignment pins from 3mm (⅛ inch) music wire about 2 inches long and insert them into the holes. Slide a lock collar onto the guide wire, and slip the hub into place. Adjust the height of the hub with the collar, and secure it with a second collar. Insert the pins in the rim-positioning holes, and slide the rim into place. Adjust the height of the rim above the jig's base with four pieces of wood. You can make a wheel with the hub centered or slightly offset to one side, depending on what your plane requires. Do this by altering the height of the wood pieces that support the downward-facing surface of the rim.

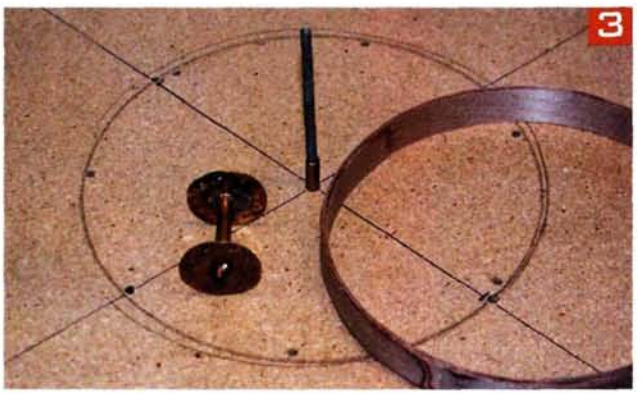
• **Spokes.** You'll need a piece of nylon fishing line that's long enough to make 36 spokes and go around the rim circumference twice. To start lacing, first tie a knot in one end of the line and insert the other end through the first hole in the rim. From there, thread the line into the first hole in the bottom hub washer and back up to the next hole in the rim. Run the line around the rim into the next hole and then back down to the next hole in the bottom hub washer. Remember that each hole on the washer serves two spokes! Continue through all the holes, and when the bottom holes have been "laced," continue with the top ones. When all of the holes have been laced through, wrap the line one complete turn around the rim, and then force it through one of the holes and glue it down with CA.



Make an assembly jig to hold the rim and hub in alignment before you start to lace the "spokes" into place. Shown here is the large jig board and the smaller, circular rim former.



Make the hub by soldering a brass disc (washer) to both ends of the brass axle tube. Drill nine holes in each disc spaced 40 degrees apart. Lock collars hold the hub in place above the building surface.

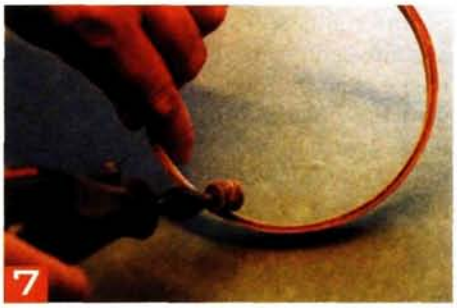


The rim is a lamination of thin plywood strips glued together around the circular former. Here you see the finished rim and hub.

Thin strips of plywood glued to the rim form the flanges that help to hold the tire in place.

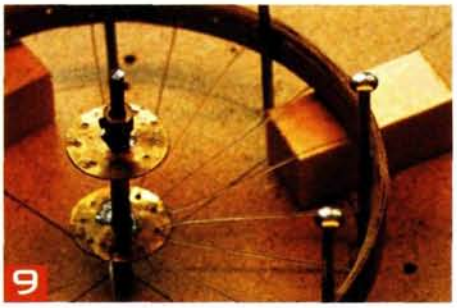
To determine the spoke spacing around the rim, cut a strip of card stock and mark it with a pencil. Divide the strip with lines into 36 equal parts. Drill a hole at each line, staggering the holes from side to side.

Sand the rim to shape with a Moto-Tool, as shown. The flanges will help to hold the tire on the rim.

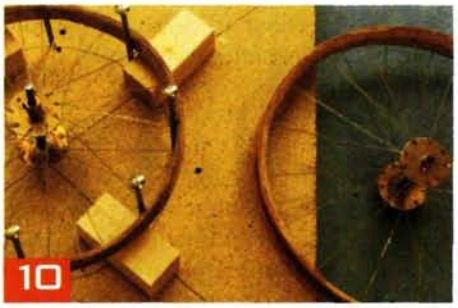


After you've sanded the outer surface of the rim to shape, sand the inside edges of the rim as well.

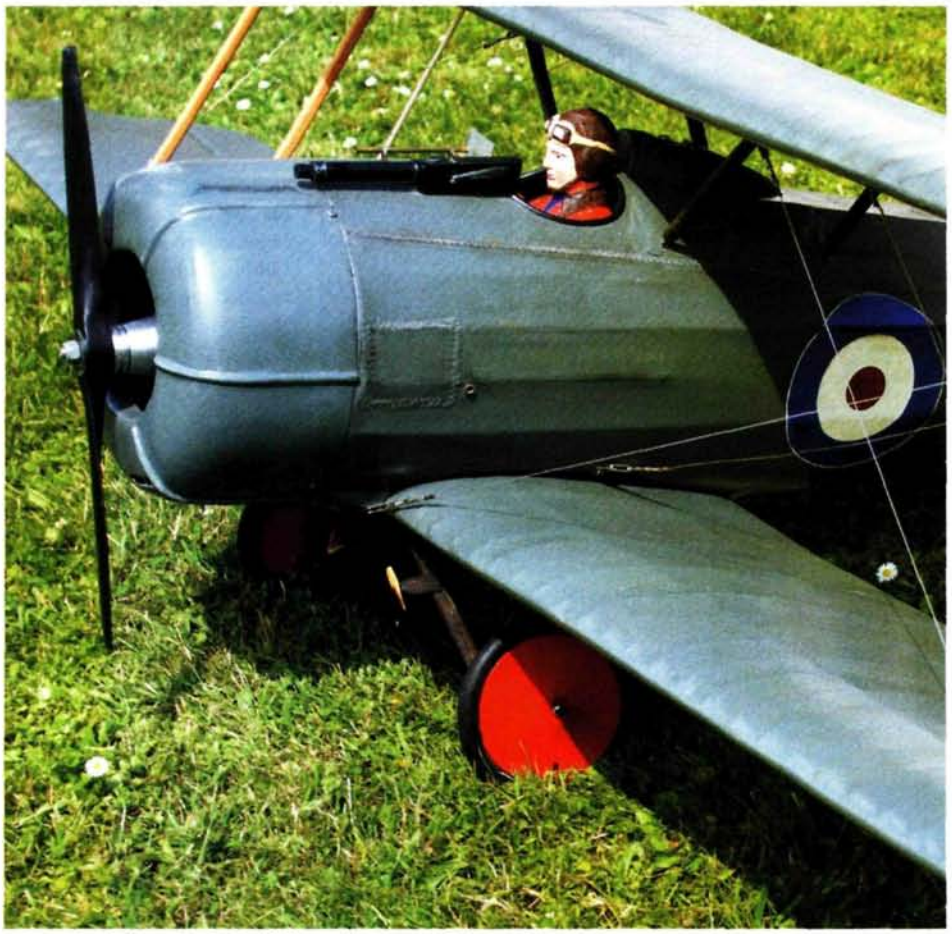
Wooden blocks and alignment pins hold the rim and hub in proper alignment. Here the finished parts are ready for the spokes to be added.



Begin lacing the nylon spokes into place on the lower hub disc.



Once the bottom spokes are in place, do the same for the top ones. Here you see the finished spokes and rim assembly to the right.



The author's 1/5-scale DH-5. With or without a fabric covering in place, the spoked wheels look very realistic. Using this technique, the wheels are also inexpensive and very light!

The trick to forming a round wheel is not to overtighten the "spokes." They should be taut, but not pulled so tight that they deform the rim. Remember that you are not tuning a piano; if you end up with an oval wheel, it means you have pulled the line too tightly. Unlace it and try again. Before you apply the CA, be sure the wheel at least looks round; a slightly "out-of-round" wheel will work without problems.

• **Tires.** I have made tires out of both closed-cell foam and foam covered with rubber from a bicycle inner tube. I have also used black rubber tubing. All worked well, but the foam tires are the lightest. You can probably find other suitable materials at your local do-it-yourself store or automotive supply shop. Simply glue the ends of the foam together to form a donut that has to be stretched only slightly to fit the rim; glue it to the rim with epoxy and let the epoxy cure. That's it! Now, make another wheel, and your model will be ready to go!

The photos show the wheels I made for my ¼-scale Swedish Ö1 Tummelisa fighter (still under construction). Making spoked wheels this way is not difficult at all. They are strong and light and, best of all, very inexpensive.

PRODUCT REVIEW

JR XP662

An affordable, programmable radio for airplanes and helicopters!

by Bob Aberle

The very popular series of JR radios has evolved over the past few years. The latest in this JR series is the 6-channel XP662—an excellent choice for every airplane and helicopter pilot, from novice to expert, at an affordable price of $250.

USING THE MODEL MEMORIES

The new system includes six model-memory positions (increased from three) that can be identified by number or by your choice of names, up to a limit of three characters, e.g., "Cub" for a Piper Cub model.

When you turn on the transmitter, the first screen you see is the NORMAL DISPLAY, which tells you "AC 1" (aircraft memory position 1) or "CUB" (the name of the plane), along with the transmitter voltage, for example, "10.4V."

For overall simplicity, there are only two computer input switches on the front of the transmitter. One is identified as "Scroll" and "Channel"; the other is "Increase" and "Decrease." When you scroll around the XP662 menus or when you add and subtract control inputs, you will find an interesting feature: quickly pushing the "Scroll/Channel" or "Increase/Decrease" button provides a single input (one increment at a time), but if you hold down either button, you can scroll much more quickly. This is really convenient when you initially set up a lot of new control inputs.

The system includes a 0.65-ounce JR R700 receiver, four NES-537 servos and a 4-cell, 600mAh Ni-Cd pack.

SYSTEM MENU

This transmitter has two menu systems. The first, or upper, level is called the "System Mode" and includes nine items. In this section, you can identify model-memory positions; reset all the data to a series of factory default control inputs; and select the wing type, such as flaperons (for flap-type control with your aileron function), V-tail mixing (for roll and pitch control on a V-tail model) and delta-wing mixing (for flying tailless models such as flying wings).

You can also select the aircraft type—either fixed wing (AC) or helicopter (HE)—and establish controls specific to each type. Although not individually called out, three programmable mixing possibilities are included, so you can tailor certain control inputs for sailplanes as well.

You can also operate the XP662 using regular FM (PPM), or you can select either of two types of PCM operation for use with compatible JR PCM receivers. When using PCM, you will also be able to program in fail-safe features. Keep in mind that when operating FM (PPM), the deviation is on the high side, so this transmitter can operate any JR FM receiver as well as most FM receivers manufactured by Airtronics. Also be aware that the XP662 transmitter does

SPECIFICATIONS

PRODUCT: JR XP662

TYPE: 6-channel computer radio w/six-model memory

DISTRIBUTOR: Horizon Hobby Inc.

TRANSMITTER: 6-channel, dual stick (Mode II); 1 lb., 7 oz.

RECEIVER: 7-channel JR R700; 0.65 oz.; 2x1x$^{9}/_{16}$ in.

SERVOS: JR NES-537; 1.38 oz. each; 43 oz.-in. output; 0.25-sec. transit time for 60-degree rotation

ACCESSORIES: switch harness with bulkhead mount; 4-cell, 600mAh Sanyo Ni-Cd pack; dual-output battery charger; aileron extension cable; servo-mounting hardware and extra output arms; frequency flag set; instruction manual.

WEIGHT OF AIRBORNE PACK: 10.1 oz. (receiver, 4 servos, switch harness, battery and aileron extension cable)

PRICE: $249.95

FEATURES: 6-channel control; six-model memory; available on 72, 50 and 53MHz RC channels; choice of FM (PPM) with high-side deviation that is compatible with Airtronics equipment as well as PCM (compatible with most JR PCM receivers). When using PCM, fail-safe feature is available.

COMMENTS: packed with features, the JR XP662 is easy to learn and to operate.

HITS
- Six model memories.
- Model name appears on startup.
- Exponential rate as well as dual-rate control.
- Can operate fixed-wing aircraft and helicopters.
- Thorough and easy-to-read instruction manual.

MISSES
- Digital trim positions are not displayed constantly.

At the top corner of the transmitter's face are the dual-rate switches for aileron and elevator.

not have a removable radio-frequency module, so the operating frequency is fixed.

Another item in the "System Mode" menu is called "Dual Rate Switch Selection." With this feature, you can combine aileron and elevator dual-rate control so that it can be operated by a single switch. Many fliers like this added convenience because both controls go hand in hand.

FUNCTION MENU

The second, more detailed menu level is identified as "Function Mode," and you will probably use it more often. It contains 12 separate items (three of which are the programmable mixing circuits already mentioned). The XP662 offers not only conventional dual-rate control of both ailerons and elevator but exponential rate control of both functions as well. Exponential control tends to desensitize the controls around the neutral position. By carefully setting this feature, a "jumpy" pilot can look like a pro. Other items in the "Function Mode" menu include servo-reversing on all six channels; endpoint or travel adjustment on all six channels; sub-trim (which allows you to store the actual digital trim position in memory and then place the trim button back at zero); aileron/rudder mixing; elevator-to-flap mixing; aileron differential; and flap-to-elevator offset trim (which allows elevator trim or compensation to be employed as the flaps are deployed to help maintain level flight).

DIGITAL TRIMS

The benefits of digital trim include more precise control application and the ability to save trim positions for each model-memory position. On many computer transmitters that have this feature, it's difficult to know where your trim position is while you're flying. To effectively solve this, the JR engineers display the trim position on the LCD when you push the trim button. Every time you hit any of the four trim buttons, you advance the trim one increment and see something like "AIL +6." That screen will disappear in a few seconds, replaced by the "Normal Display." A little later in the flight, if you want to add more trim, hit the trim button again; you will see "AIL +8." If you use this feature to check the trim position, remember to return it to its original position; otherwise, you may constantly add or subtract trim positions during your flight. It is important to note that the XP662 automatically stores digital trims in the system memory, so you don't need to go to a secondary function, such as "Trim Offset Memory."

ADDITIONAL FEATURES

The XP662 also has a throttle-cutoff switch at the top right side of the case

Normal display.

This is the momentary trim display for ailerons.

Exponential-setting screen for elevator.

that automatically stops the engine; this quick, effective control is a nice safety feature.

Most JR transmitters have an internal lithium battery that maintains the overall computer system memory. This battery is rated to have a life of about 5 years; after that, you should send in your transmitter for a battery change, general cleaning and maintenance check (this is a good idea for any RC transmitter).

As already pointed out, the XP662 system can be programmed for fixed-wing or helicopter flying. Two switches at the top left and right corners of the case have different functions, depending on whether you are set up for fixed-wing or helicopter operation. The left switch controls retractable for aircraft and "flight mode" for helicopters. The right switch is a flap or mix switch for aircraft or a "throttle

The 600mAh Ni-Cd will power the transmitter for more than 2 hours before it needs to be recharged.

hold" function for helicopters. JR provides decals that you can put next to each switch to help identify the shared functions.

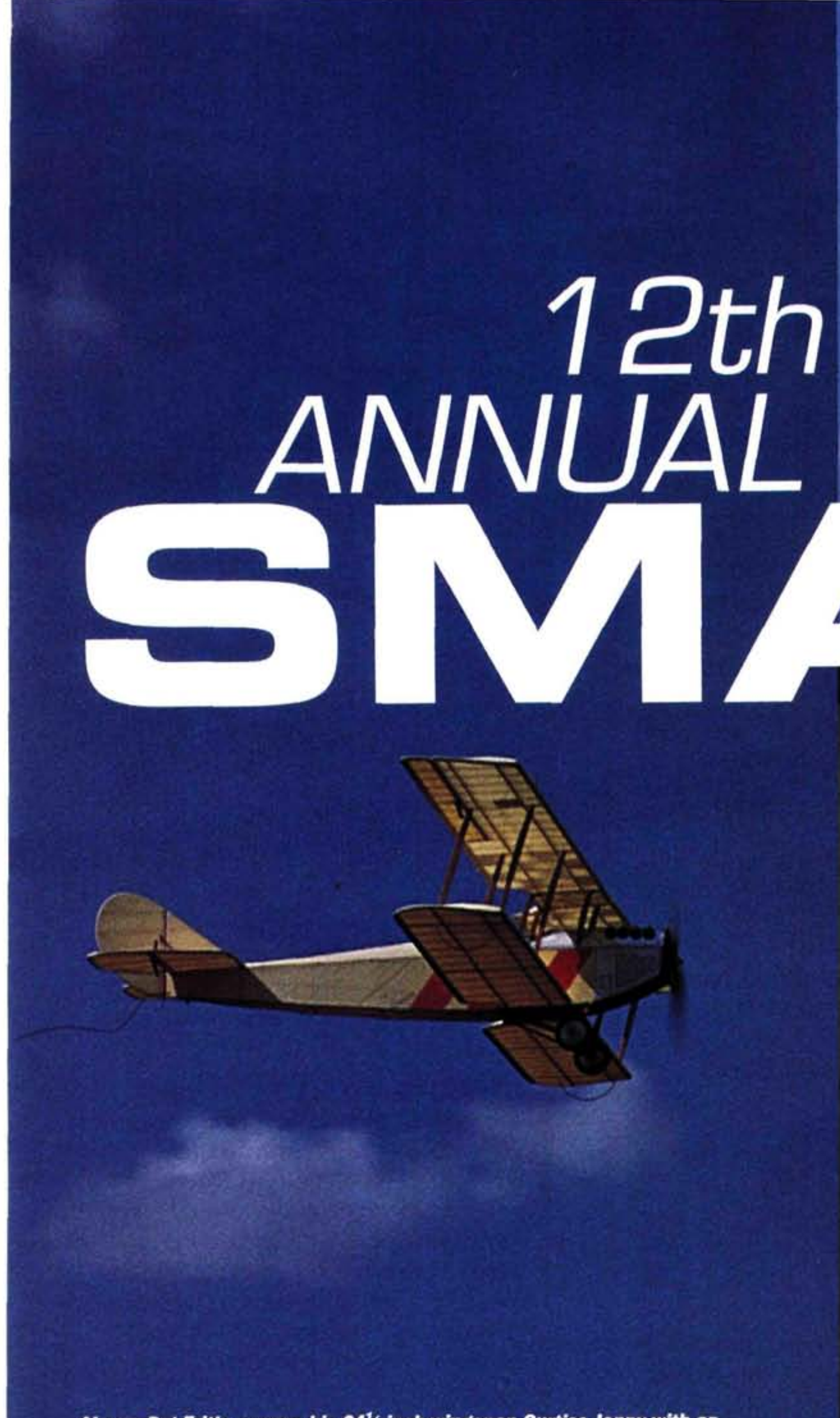
The airborne components of the XP662 system include a 0.65-ounce JR R700 receiver, four NES-537 servos and a 4-cell, 600mAh Ni-Cd pack. Total weight of the airborne pack is 10.1 ounces.

SUMMARY

I like this new XP662 radio very much—especially its six model-memory positions and optional fixed-wing or helicopter operation. It's a full-coverage RC system that's suitable for pilots of any flying skill level. It is very simple to understand, to establish control inputs and to use, and its instruction manual is thorough, well-organized and very easy to read. And at $250, it's an excellent choice!

JR; distributed by Horizon Hobby (877) 504-0233; horizonhobby.com.

12th ANNUAL SMALL FUN FLY



Above: Pat Tritle powers his 64¾-inch-wingspan Curtiss Jenny with an 05 Olympus belt drive. Below: Scott Cannon converted this 1930s-era free-flight Lanzo Pusmoth to radio control. It's covered in Polyspan and powered by a Speed 280 motor.

Left: Jim Ault's Red Zephyr is actually a 1936 free-flight model called the Comet. His friend and fellow member of the Society of Antique Modelers, Gordon Loiselle, reworked the 72-inch-wingspan model for radio control and added a Fox .25 engine. Top right: Alan Porter built his Spad 13 from a Sterling kit. It has a 25-inch-wingspan, weighs just 10 ounces and is powered by a GMARK .033 antique engine. Check out that finish! Right: Paul Willenborg finished his Fantastic Models F-86 Sabre in the colors of the Holland Air Force Show Team.

Big fun in Little Rock

by Jaime Lagor

For three days every spring, small-airplane enthusiasts from across the country gather in the heart of Arkansas for what has become an annual retreat defined by fun, fellowship and—oh yes—a lot of radio control flying. From May 31 through June 2, the North Little Rock Sky Tigers (formerly known as the Maumelle Sky Tigers) played host to the 12th Annual Small Model Airplane Lovers' League (SMALL) Fun Fly. For the first time, the event took place at the Sky Tigers' beautiful new flying field in North Little Rock's Burns Park. Armed with a new name, a new home and a lot of good ol' Southern hospitality, the Sky Tigers proceeded to put on one of its most successful fun flys ever.

Jim Olive's Great Planes Slow Poke is powered by an O.S. .26 4-stroke engine.

PHOTOS BY JAIME LAGOR

Left to right: Randy Birt's P-47 Thunderbolt looks almost as good on the ground as it does in the air. • This 24-inch-wingspan Scalliwag was designed and built by Steve Adams. Constructed of sheet balsa and powered by a PAW .049, Steve's little bipe may soon be available as a kit. The Scalliwag also has a 20-inch-wingspan baby brother called the Squib. • Harold Poindexter's Thunder Tiger Slowfly Mustang is powered by an O.S. .25FX. • These Puddle Jumpers were designed by Roe Apt and built by the father-and-son team of Dave and Dave Patterson (that's Sr. and Jr.). The larger plane was given to Mark Humphries as a gift; it's powered by a K&B Sportster .20.

This SE5 was one of several models Keith Sparks brought along. Keith designed the model for both indoor and outdoor use. Here, it's powered by a Speed 280 motor.

Duncan Stone's Sig Kadet is a flying symbol of the true SMALL spirit.

Above left: designed and built by 16-year-old Chris Bowker, this 36-inch-wingspan model is powered by a Hacker brushless 15L motor geared 4:1 and makes an impressive sight when it's airborne. Chris has been attending SMALL since he was old enough to walk, never mind fly. Above right: Danny Wampler's PT Bee is powered by an O.S. .10. Right: Patrick LeRay designed and built this colorful creation. "Spot" is powered by a Black Widow .049.

SMALL is an informal "organization" of RC pilots united in their dedication to preserving and perpetuating the enjoyment of small model airplanes. These models are, in fact, the foundation on which the hobby grew; they existed long before the term "giant scale" was ever coined. Here and at other, similar fly ins across the country, the only airplanes that are qualified to participate are those powered by .25ci or smaller engines.

In a society that thrives on competition and that values winning above all else, events such as this are rare and refreshing. It isn't a contest; there are no points, no winners and, certainly, no losers. In fact, it doesn't take long to realize that, more than anything else, this annual fun fly is about camaraderie, friendship and a shared enthusiasm for all things small. This year, 85 pilots registered for the three-day affair, and not one of them went home disappointed.

Growing up in New England and never having ventured anywhere near the Mason-Dixon line (never mind below it), I faced with some trepidation the prospect of setting up camp in an open field for three whole days in blazing 95-degree heat and unbearable humidity. But after observing these experienced Southerners and diehard SMALLers for just a short time, it hit me that maybe the heat wasn't an obstacle; it was a catalyst. Before long, I realized that sitting in the shade and enjoying good conversation with old

INDOOR FLY-IN

On Friday night, a few dozen truly daring pilots gathered in the gymnasium of North Little Rock High School for some indoor action. Ignoring the sweltering heat that made the unventilated gym feel like the inside of a barbeque pit, more than a few brave souls attempted to weave their fragile models through an obstacle course of basketball hoops and bleachers.

As expected, a couple of models eventually succumbed to the inevitable. One plane had a particularly impressive run-in with a backboard before gracefully falling through the net—a shot worth two points, had the scoreboard been working!

But without a doubt, the smallest planes were the biggest draw. Henry Pasquet, well known for his ability to redefine the term "micro flyer," brought his collection of micro-actuator-controlled miniature wonders. And believe me, when these things take to the air, everyone notices. Henry's smallest model weighs in at just 959 milligrams and is considered to be the smallest radio control plane on record. The rubber band-powered "Little Bit Rubber" has a wingspan of just 4¾ inches, yet it exhibits enough stability and control in flight to rival that of its big brothers.

Henry also brought his 3-channel Microbats, in both 7- and 9-inch wingspans, which are powered by KP-00 motors and lithium-polymer batteries. But the Lacey-M-10 is perhaps his most impressive model. Consider this: a scale model that weighs just 2.1 grams and has a wingspan of only 4.9 inches. Henry's hangar is something you just have to see to believe.

Left: Henry Pasquet's Little Bit Rubber weighs just 959 milligrams! Right: Ken Spencer scratch-built this vintage Blériot.

Though none of them saw any flight time, Ken Spencer's collection of antique planes was certainly another top draw. Most impressive was the 8.96-ounce Blériot. The painstakingly detailed cockpit was accurate right down to the pedals, which move in response to aileron control.

Despite the heat and the occasional mishap, a good time was had by all. The leisurely spirit of fellowship and fun that has come to define SMALL was as evident indoors as it was outdoors.

AWARDS

Best Power Plane	Mike Pate
Best Power Plane, Scale	Scott Johnson
Best Electric Plane	Ken Spencer
Best Electric Plane, Scale	Pat Tritle
Spirit of SMALL	Pat Tritle

If they gave an award for originality, Gary Jones would win it. This is one of his creations.

Above: Pat Tritle's ½-scale Wright Flyer. Right: Scott Johnson designed and built this 50-inch-wingspan Air Tractor and equipped it with flaperons. It's powered by an O.S. .25FX.

friends while sipping a cool drink was all part of the SMALL spirit.

This is not to say that the models spent more time on the ground than in the air; each pilot certainly had a fair share of turns around the field, some having brought multiple models. At any given time, at least two or three planes were diving, spinning and gliding overhead or racing down the flightline.

Pat Tritle's Curtiss Jenny Biplane was a definite crowd-pleaser. Picture this: a 64¼-inch-wingspan vintage model swooping gracefully overhead with only an 05 Olympus belt drive. It flew so true to scale that you would be hard-pressed to distinguish it from the real thing—from a distance, of course.

One of my favorites was Dale Womack's ½-scale Zero. Powered by an O.S. .25 SF engine, this model zoomed past the crowd so fast that it nearly left a streak in the air. Amazingly, Dale's plane is almost 10 years old, and it still runs like a hot-rod!

Throughout the weekend, pilots took turns astounding the crowd, one after the other grabbing the attention of those lounging in the shade. For example, David Bowers and Mark Smith took advantage of any lull in the action to take center stage with their Stop Sign and Flippin Disc. Their ability to make these two radio-controlled flying discs seem to romp playfully around the field was certainly intriguing.

Ever seen a Mustang seemingly hang in midair? I have—now. Harold Poindexter performed some amazing aerobatics with his Slowfly Mustang from Thunder Tiger. Powered by an O.S. .25 FX, this model grabbed its fair share of oohs and aahs.

The entire weekend was crammed with more highlights than I can recount here. In addition to Saturday's all-day extravaganza and some open flying time on Friday and Sunday morning, the weekend included an indoor flying session on Friday night and an awards banquet on Saturday night.

By Sunday morning, only a few truly dedicated SMALL enthusiasts remained, but plenty of high-flying action was still to be found. Paul Willenborg certainly made the most of the open air with his 25-inch-wingspan F-86 Sabre from Fantastic Models. Nicely finished in the colors of the Holland Air Force show team, Paul's little fighter was the definition of "eye-catching."

Many thanks to contest director Ron Stanfield and all the North Little Rock Sky Tigers for their hard work and hospitality. Their diligence resulted in another truly successful event, and I returned home with a better understanding of just what SMALL is all about.

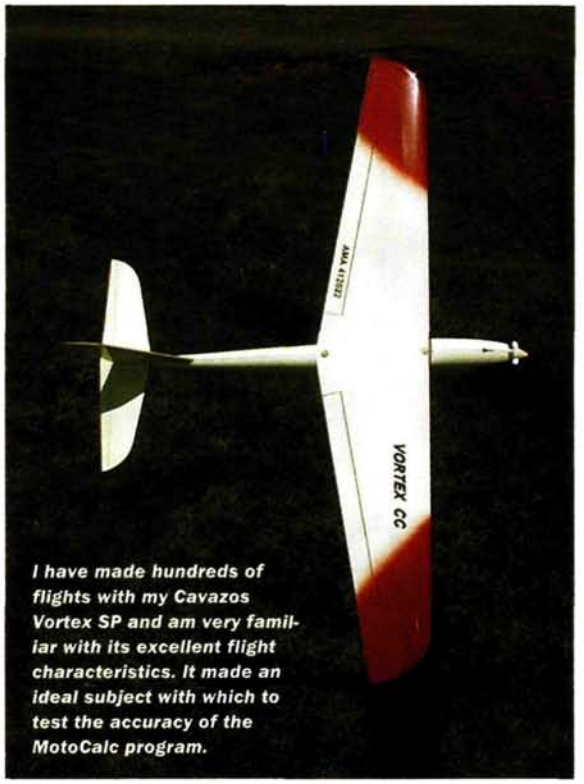
I headed north convinced of something I had suspected from the moment I arrived at Burns Park: SMALL is not as much an organization as it is a family. And like many families, they have a reunion every year. This is perhaps best illustrated by Duncan Stone, who for the past three years has brought along his Sig Kadet. Built by Ron Stanfield, the Kadet was raffled off at the fun fly three years ago, and ever since, it has made the annual pilgrimage with Duncan to reunite with all the other members of this extended family. Over the years, the plane seems to have taken on a new persona. Today, it is more than a plane; it's also a flying symbol of SMALL's true spirit. ✈

PRODUCT REVIEW

CAPABLE COMPUTING INC.
MotoCalc

Removing the guesswork from electric flight setups

by Greg Gimlick



I have made hundreds of flights with my Cavazos Vortex SP and am very familiar with its excellent flight characteristics. It made an ideal subject with which to test the accuracy of the MotoCalc program.

Modelers know that they need tools to practice their craft. This includes the usual selection of hand tools that has been around for decades, but electric fliers should also learn the value of a good performance simulator. Simulators for electric-flight equipment have really come into their own in the last few years. One such program is Capable Computing Inc.'s MotoCalc. It is one of the more detailed of these programs, and with the right input, it can really save you time, money and frustration as you select the perfect combination of model and equipment to produce the flight characteristics you're looking for. Sure, you can do the same task with a calculator and a lot of formulas, but MotoCalc makes it much easier and will translate the results into simple language, if you wish.

This is a full-featured performance simulator, and as such, it has a slightly steeper learning curve than some, but I find the additional features to be well worth the effort to master the program. A particularly nice feature of MotoCalc is that a fully functional trial version can be downloaded from www.motocalc.com. If you decide you like it, you can register and pay for it online. It will run for about 30 days before you must decide whether to buy it, but considering the time, money and aggravation it saves you, you'll wonder why you didn't buy it sooner.

WHERE DO I START?

If you are brand new to electrics, it can be intimidating to look at a screen full of unfamiliar inputs. MotoCalc has a "MotoWizard" help feature that guides you through it all, and I suggest you use it to help familiarize yourself with the program, even if you have used another program, such as ElectriCalc. When you start MotoCalc with the Wizard activated, it brings up the screen shown in Figure 1. I'm going to use my Cavazos Vortex SP airplane as the subject in this simulation. I enter the name of the model and select "1 Motor." Pretty easy so far, right? If you want to use a plane that's already in the database, you can hit the button that says, "Copy Plane from MotoCalc Window." Hit "Next," and the performance window pops up and asks what your performance and duration expectations are for the plane. Hit "Next," and the third screen (Figure 2) appears. Enter the wingspan, area and approximate weight without the motor, battery pack and speed control. This confuses a lot of folks, but it makes sense if you want to change setups in the program. The airframe's weight always remains the same, but the weight of equipment varies. By entering the weight of airframe and radio only at this stage, the final flying weight is adjusted automatically when you change power systems in the simulation.

Figure 1.

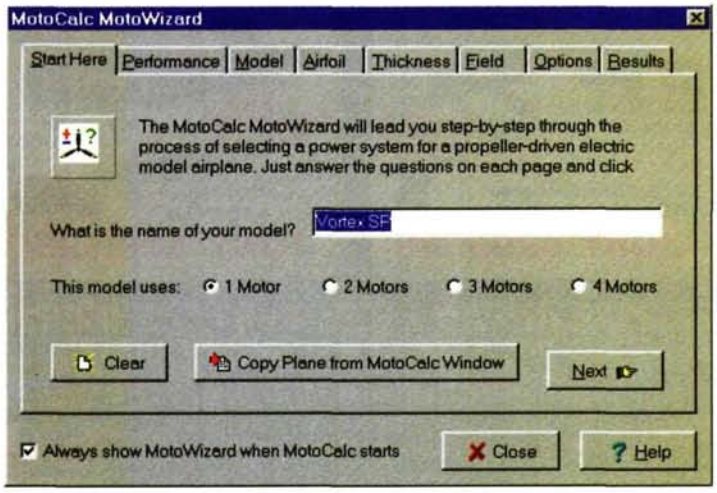
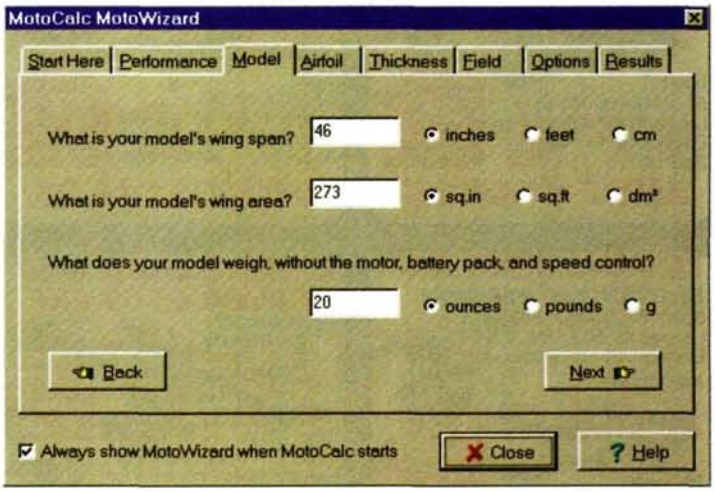


Figure 2.



Left: the MotoCalc MotoWizard Start screen; here, you name the model and specify the number of motors. Above: you enter your airframe's basic specs in the Model screen. Note that the weight is entered without the motor, ESC and battery.

The next two screens concern the airfoil type and thickness, but don't let that intimidate you. The Wizard just wants you to select the style (under-cambered, for example) and the relative thickness (Figures 3 and 4). I'll discuss this more later, but for now, just choose what looks like your wing's cross-section.

Figure 3.

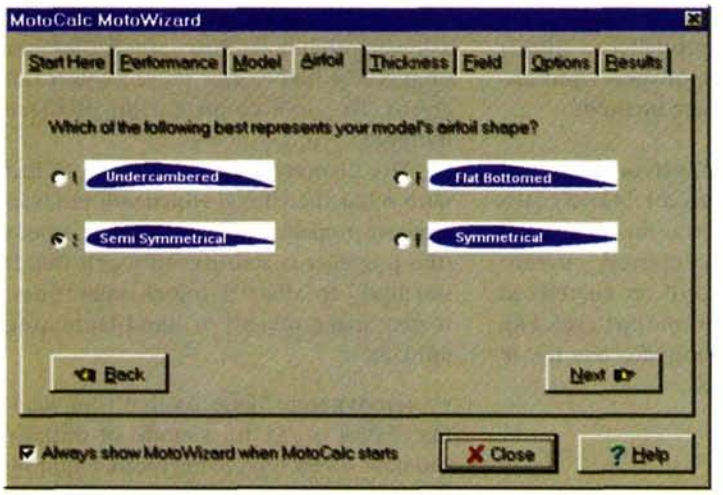
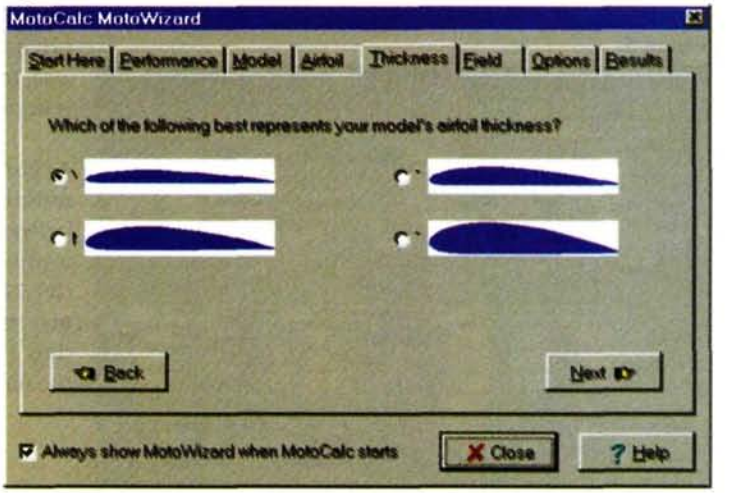


Figure 4.



On these two screens, choose the basic airfoil type and thickness that best match your model's wing.

The screen labeled "Field" gives the program some environmental data to adjust its calculations. If you live near an airport, you can easily check out the elevation of your area by calling the fixed-base operator; otherwise, you can check a map or just guess. This data helps the program adjust for atmospheric influences on performance.

The "Options" window lets you specify some motor parameters or let the program select them. Since I know I'm going to use an Aveox 1406-2Y direct drive in my Vortex, I selected "direct drive only," "brushless only," "Aveox" and "at most 8 cells." I like this window because it allows you to plug in a system that you have on the shelf and see how it will work.

"BUT IT'S THE WRONG MOTOR!"

The program recommended an Aveox 1015/1.5Y motor on 7 cells to swing a 7.5x5 prop. I'm using a 1406/2Y motor, so what do we do now? Don't panic; you don't have to buy a new motor just yet! Of course, if you haven't bought a drive system, this will give you a good recommendation about which one to buy. But to specify the motor I want to use, I hit the "Copy Result to MotoCalc Window." The main screen pops up with all the data the program selected. Since I know I want the 1406 motor, I just go to the motor section and choose "Open." The pop-up window (Figure 5) shows a list of motors; I highlight the 1406. Click "OK," and the info will replace the old info in the main window. Figure 6 shows the main screen with all the changes made to reflect the equipment I have for the Vortex. The battery, prop and speed control changes are done the same way as the motor. I have some old 1400SCR cells and a folding 6x6 prop, so I simply selected them from their respective lists.

ACCURACY MATTERS

Before I hit the "Compute" button, I want to make everything as accurate as possible. In the information that comes with the Vortex SP, it says that it uses a thinned RG-14 airfoil. I may not know what that means for my performance, but I do know that it will make the projection more accurate if I can enter the information. It's specific and will replace the estimations I made previously in the airfoil windows. At the top of the main menu line is a button for "Airframe," and under that pull-down menu is a selection for "Coefficient Calculator." Selecting that brings me to the window seen in the Figure 7 screen.

Don't worry; this is a lot of scientific data, but MotoCalc makes it easy for you to understand what it's asking. By selecting "Choose From List," you get a long list of airfoils by name or number designation. I don't have to know what an RG-14 is to be able to select it from the list. Once selected, the program adjusts the picture in the window and gives the data for the airfoil. Since I know this one is thinned about 1 percent, I moved that slider to the left. I accepted the rest of the airfoil default settings.

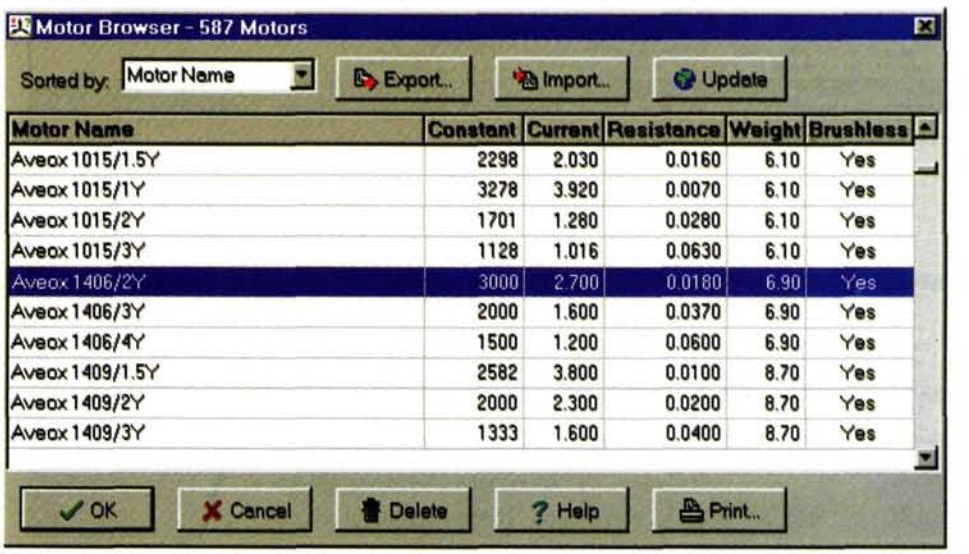
On the right side is a list of things that affect drag. All you have to do is select the attributes that reflect your particular airplane. Once you do that and hit "OK," it updates the information in the main window. By the time you see it, the program has already done the math. All that's left to do is to hit "Compute." The next thing you'll see is the performance prediction (Figure 8).

WHAT DOES IT ALL MEAN?

There's no denying that a screen with lots of numbers and charts can be intimidating for those of us who aren't math and science wizards, but take a moment to look it over. The top box lists the equipment and highlights some key stats from the chart below. The chart lists power and flight information with your specified setup as it corresponds to airspeed and plots it in 1mph increments. This data is quite informative once you take a moment to consider what each relates to.

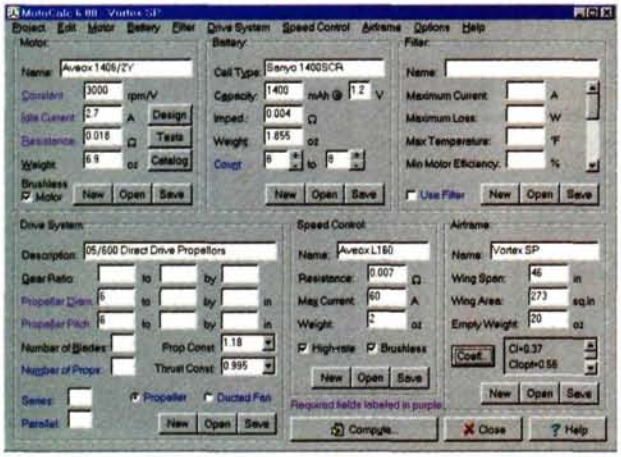
But the best feature has to be the "Opinion" button. Hit this, and MotoCalc analyzes the data and tells you what it

Figure 5. ***The Motor Browser window allows you to scroll through nearly 600 motors.***



Motor Name	Constant	Current	Resistance	Weight	Brushless
Aveox 1015/1.5Y	2298	2.030	0.0160	6.10	Yes
Aveox 1015/1Y	3278	3.920	0.0070	6.10	Yes
Aveox 1015/2Y	1701	1.280	0.0280	6.10	Yes
Aveox 1015/3Y	1128	1.016	0.0630	6.10	Yes
Aveox 1406/2Y	3000	2.700	0.0180	6.90	Yes
Aveox 1406/3Y	2000	1.600	0.0370	6.90	Yes
Aveox 1406/4Y	1500	1.200	0.0600	6.90	Yes
Aveox 1409/1.5Y	2582	3.800	0.0100	8.70	Yes
Aveox 1409/2Y	2000	2.300	0.0200	8.70	Yes
Aveox 1409/3Y	1333	1.600	0.0400	8.70	Yes

Figure 6.



Above: the Main Program window displays all the major components after you've selected them. Right: if you have more specific airfoil data available, you can enter it in the Lift and Drag Coefficient Estimator window.

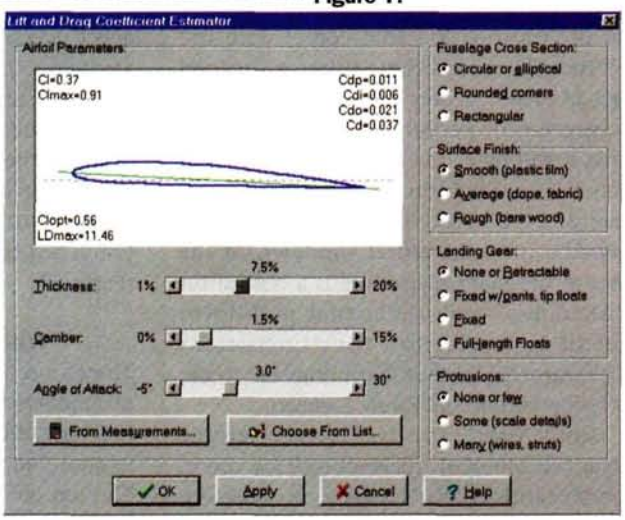
"thinks" of your setup. Best of all, it does so in simple terms that mere mortals can understand, and it helps by pointing out potential problems. Here are its comments for the test plane:

• **"Possible Power System Problems.** The steady-state battery temperature (approximately 148° F) is higher than the suggested maximum temperature for this cell type (140° F), which can result in battery-pack damage. A lower current would decrease the battery temperature.

"Current can be decreased by using fewer cells, a smaller diameter or lower pitched propeller, a higher gear ratio, or some combination of these methods.

• **"Power System Notes.** The motor current (44.9A) falls between the motor's maximum efficiency current (29.7A) and its current at maximum output (165.1A), thus making effective use of the motor.

Figure 7.



• **"Possible Aerodynamic Problems.** The static pitch speed (115mph) is much greater than 3 times the stall speed (26mph), which may make takeoff or hand-launching very difficult and is inefficient in flight unless very high speeds are intended.

"Pitch speed can be decreased by using a lower pitched and/or larger diameter propeller, a higher gear ratio, a lower cell count, or some combination of these methods.

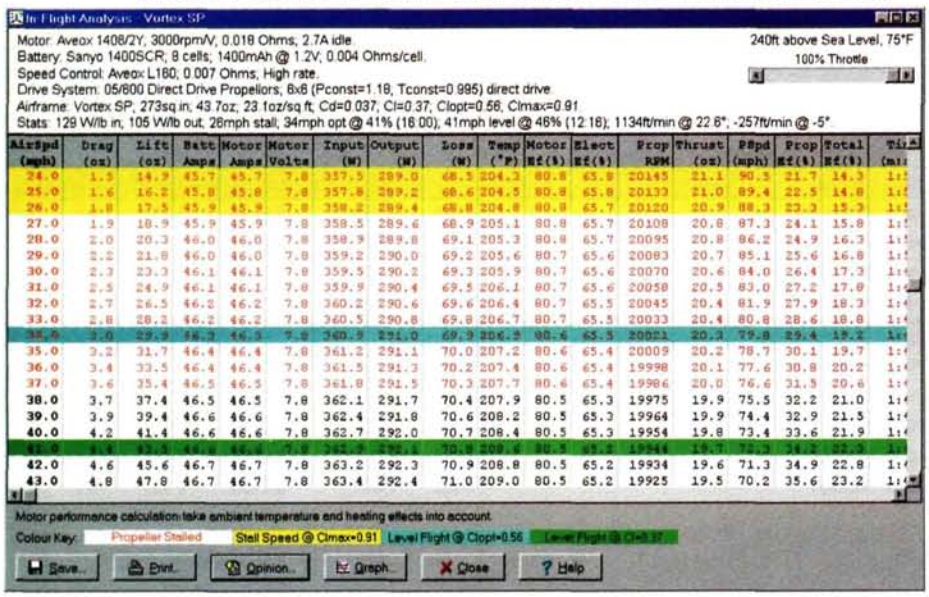
"The diameter (6 in.) to pitch (6 in.) ratio is less than 1.5:1, which will result in reduced propeller efficiency at low speeds (the propeller is stalled). Although this is not likely to affect flying characteristics, it may make takeoff or hand-launching difficult.

• **"Aerodynamic Notes.** With a wing loading of 23.1 oz./sq. ft., a model of this size will have a very high flying speed, requiring the undivided attention of an expert pilot. The high weight will provide good penetration, even in strong winds.

"The static thrust (23.1 oz.) to weight (43.7 oz.) ratio is 0.53:1, which will give strong climbs and rapid acceleration. This model will most likely readily loop from level flight and will have sufficient thrust for most aerobatic maneuvers.

• **"General Notes.** This analysis is based on calculations that take motor heating effects into account."

Figure 8. ***The In-Flight Analysis window. There's a lot of data to absorb, but the presentation is straightforward and the "Opinion" feature greatly simplifies the important material.***



IS IT ACCURATE?

I think it is. I've had hundreds of flights on the Vortex with this setup, and the numbers from the simulation seem to match well. I don't expect the amp reading to be exactly what's predicted, and I can only guess at my flying speed, but they are close. This gives prospective builders of the Vortex an excellent idea of what to expect. For folks like me who already own one, it gives some specific areas to address if I wish to make improvements to the model's performance.

IN THE END ...

This is a tremendous program that is sometimes overlooked because some think it's too complicated. I would say it's as easy or as difficult as you want to make it. If you want "scientific" results, it can be tweaked to your heart's content. If, however, you want quick, easy answers to some basic questions about model setup and projected performance, just do as I've outlined above and you can have accurate, useful results in a lot less time than you might think. With MotoCalc's free 30-day trial, what do you have to lose? ✈

Capable Computing Inc. (519) 638-5470; motocalc.com.
Cavazos Sailplane Design (909)485-0674; rcglider.com.

CONSTRUCTION

A menacing-looking glider with great performance

SPECIFICATIONS

MODEL: V-Stingray

TYPE: V-tail glider

WINGSPAN: 92.25 in.

WEIGHT: 5 lb.

WING AREA: 940 sq. in.

WING LOADING: 12.3 oz./sq. ft.

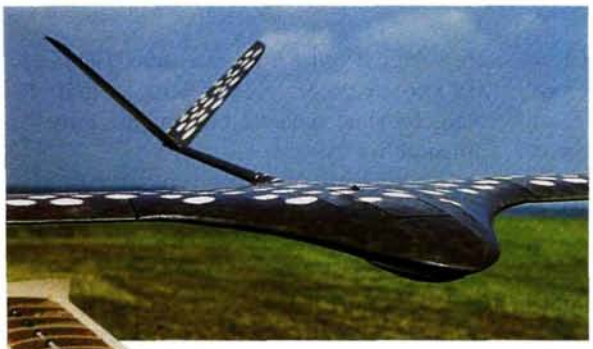
LENGTH: 44.5 in.

AIRFOIL: modified Goettingen 602

RADIO: 2 channels (rudder and elevator mixed for ruddervator control)

COMMENTS: this unusual-looking, lightly loaded glider is a real eye-opener that was inspired by the sea-dwelling stingray. Designed to maximize the fuselage's lifting surface, the model uses traditional wood and plywood construction and incorporates carbon-fiber tubes for use as the tail boom and wing spars. It has plug-in wing panels for easy storage and transportation.

THE V-Stingray



by Dick van Mourik

Medium-size gliders are very popular at many European clubs, and our local flying field is no exception. One drawback is that they all look basically the same, and there seems to be little room for experimentation. During a recent club discussion about gliders, we talked about designing a model with a fuselage that formed an integrated part of the wing; the idea was that such a configuration would use the fuselage to add to the model's lifting surface. Though not a new concept, it is far from common on a glider; besides, it would be a welcome change from the gliders usually seen at the flying field.

Here, the completed V-Stingray awaits covering and painting. Interesting shape!

BASIC LAYOUT

The dubious honor of designing and building this model fell to club member Gert Aberson, who has experience with many diverse models. Gert builds and flies just about everything, from helicopters to miniature delta wings and everything in between. He also has a soft spot for gliders.

To keep the model easy to store and transport, its wingspan could not exceed 94 inches. The airfoil section—always a key factor in any glider design—was chosen after careful and extensive testing. Many flights have been carried out with different prototypes to determine the best usable airfoil section. A slightly modified version of the German Goettingen 602 section gave the best overall results.

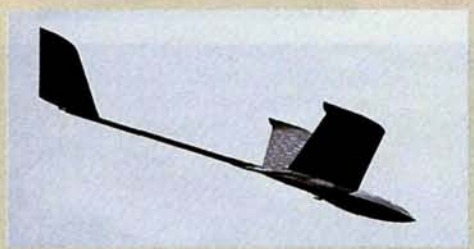
Mainly for aesthetics, the model was designed with a V-tail configuration. This also decreases weight because a third tail surface is absent. A V-tail (with its reduction in weight) also allows a somewhat smaller tail boom (a ¾-inch carbon tube) —a further weight-saving benefit. The model's overall construction uses balsa and plywood parts in high-stress areas; carbon rods are used for the wing spars to ease the building process.

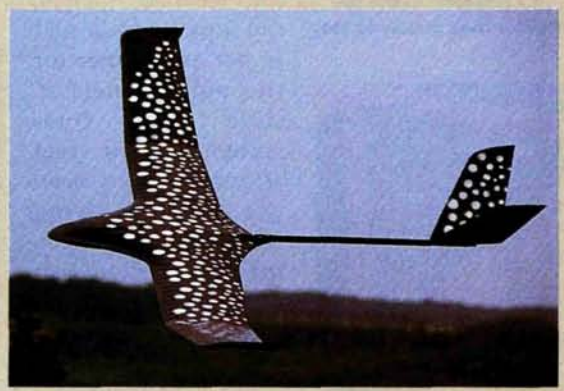
CONSTRUCTION

Start with the fuselage. Its base is formed by an ⅛-inch balsa core plate sandwiched between two layers of 1/16-inch plywood. From the fuselage centerline outward to the point at which the wing panels are attached, the cross-section gradually changes to that of the Goettingen 602. The wing shape that is, of course, the fuselage's major feature looks far more complicated than it actually is. The leading edge is made of moistened and laminated 1/32-inch balsa. Hammer a row of small nails into the building board on each side of the lamination to hold it in shape until the aliphatic glue has dried. Once it has dried fully, sand it to shape.

The prototype's tail boom was actually a ¾-inch-diameter (20mm) fiberglass fishing rod obtained locally. You could also

FLIGHT PERFORMANCE





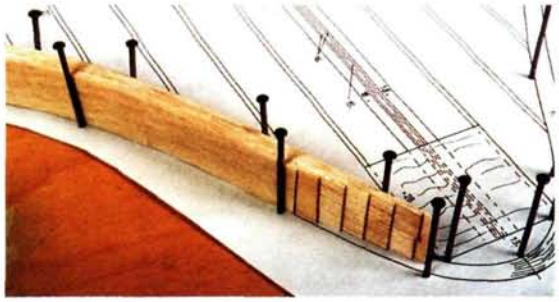
So far, the V-Stingray has been launched into the air with both a towline and a piece of bungee elastic (high-start), although being towed or carried by an engine-equipped model for an air launch is surely possible. During its initial flight trials, the Stingray performed as flawlessly as any typical light-weather glider. Flying with stronger winds is possible, of course, but as the model has a tendency to become a bit twitchy, you may need to add sufficient ballast. Penetration is more than acceptable for a model of this size, mainly because of its low wing loading and efficient airfoil selection.

Thermal behavior is just great; even the slightest puff of rising air takes the model up in no time. In light wind conditions, this model is a real treat! Its general handling can best be described as docile; it does not possess any nasty habits, and it is a great choice for those who want to get their feet wet in building from a plan.

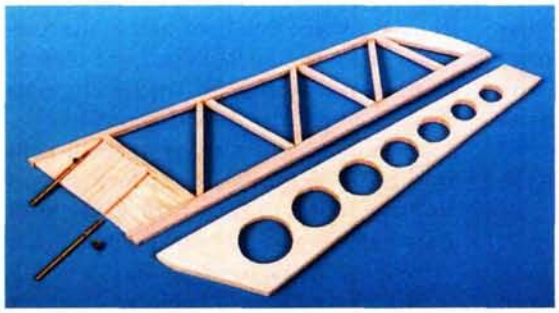
The odd color scheme really adds to the overall appearance. Look at the model when it's high in the sky; its appearance seems even more outrageous. It surely is different!

Have a go at this unusual glider; you will not be disappointed.

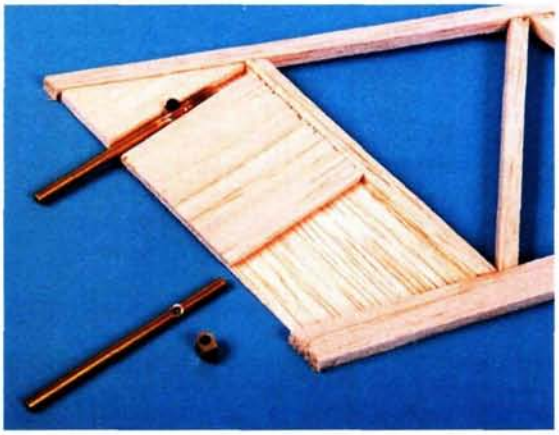
The center rib is the first part of the fuselage to be built. Made from a lamination with a 1/16-inch balsa core capped on each side with 1/16-inch plywood, the center rib slides onto and is glued to the tail boom. Note the towhook reinforcement tabs that will be glued into the rib; they transfer launch stresses to the main wing spar to spread the load.



The wing/fuselage leading edge is a lamination of several strips of 1/32-inch balsa. It is formed around nails hammered into the building board. Once the glue is completely dry, it is sanded into shape and glued to the ribs.



The tail surfaces are simple girder construction and are easily built flat over the plan. These alignment tubes are made of brass tubes and wheel collars. They are epoxied into place in the tail surface, and the setscrew holds them in place over the alignment pin that's fastened to the tail boom. Similar lock tubes hold the outer wing panels to the center section.



The tail surfaces are joined to the tail boom with pins and tubes, just as the wing panels are attached to the fuselage.

make your own fiberglass tube or use a composite helicopter tail boom.

The wing/fuselage section is sheeted in 1/16-inch balsa; the underside sheeting spreads from the fuselage centerline toward the last rib. On the top side, the sheeting extends from the centerline and covers the first two ribs. The towhook forms an integral part of the fuselage and is also connected to the main wing spar to spread the load during launches. You can make the towhook out of printed-circuit-board material or sheet aluminum. Attach it to the fuselage early in the building process.

OUTER WING PANELS

The plan shows several wing ribs, but not all of them are for this tapered wing design. The plan indicates which rib cross-sections are to be used to form the remaining ribs by using the "sandwich" method of stacking and sanding them to shape. To provide a positive glue platform for the ribs to be placed on, the wing's leading edge is made out of two parts glued together into an L-shaped cross-section. The shape also offers some additional rigidity to the thin wing with only a slight increase in weight.

A 3/8-inch-diameter carbon-fiber tube acts as the main wing spar; it runs through the fuselage section and ends at the first part of the wing, as shown on the plan. The outer wing panels also use tube spars. A length of tube is slid into the main spar to act as a joiner for the outer panels to slide onto. One-sixteenth-inch steel alignment pins keep the individual wing panels aligned with the center section. Half of the pin is glued into the outer wing panel, and it is then slid into a brass tube in the wing/fuselage center section. They are easily locked into place with connectors (wheel collars and setscrews) that are soldered onto the brass tube. Details are shown on the plan. Bent 1/4-inch-diameter steel pins are used as the outer dihedral braces.

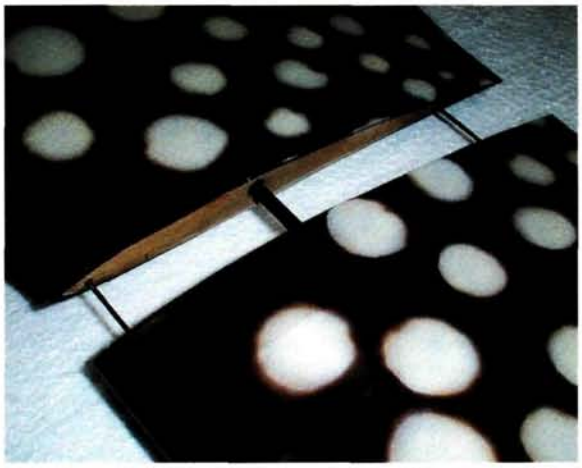
The empennage is of typical girder construction and is built flat over the plan. Both halves slide onto two steel pins that are inserted into the tail boom and secured with thickened epoxy. A connector similar to the wing's attachment is built into the tail surfaces and keeps both halves securely in place. The V-tail's dihedral angle shown on the plan has proven to work fine, but the angle is not very critical; anywhere between 90 and 110 degrees will do nicely. Making it 90 degrees will result in a more responsive rudder, while 110 degrees will provide more elevator response. It is merely a matter of personal taste.

The incidence-angle difference between the wing and the V-tail is about 1½ degrees; again, this is not critical.

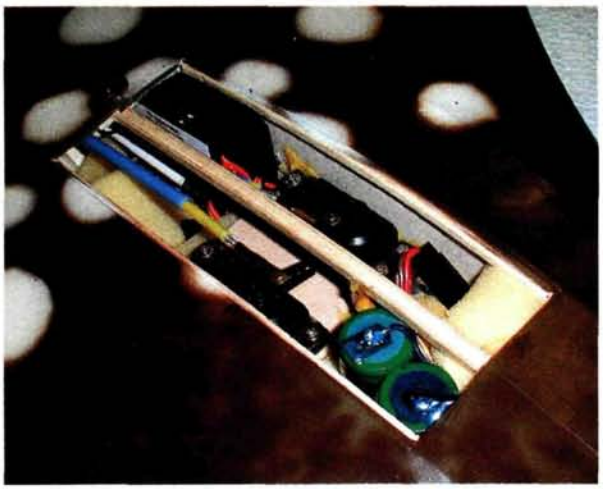
RADIO GEAR

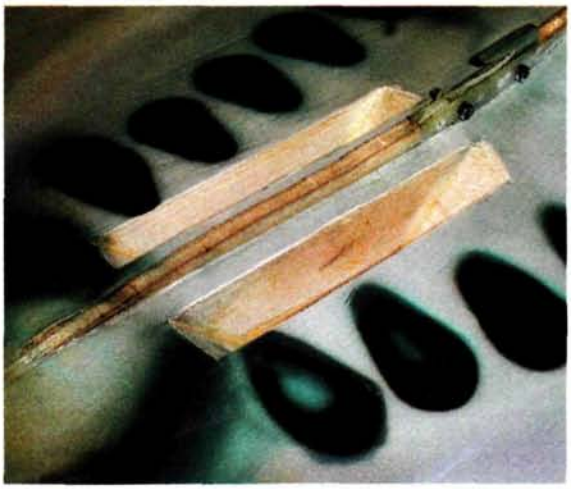
On the prototype model, Gert used an 1800mAh battery pack—probably sufficient to last a week, but the alternative would have been to use lead ballast to

The wing is held in place with setscrews that are inserted from the underside of the panel.



The wings plug into place and are held in alignment with the steel lock pin.





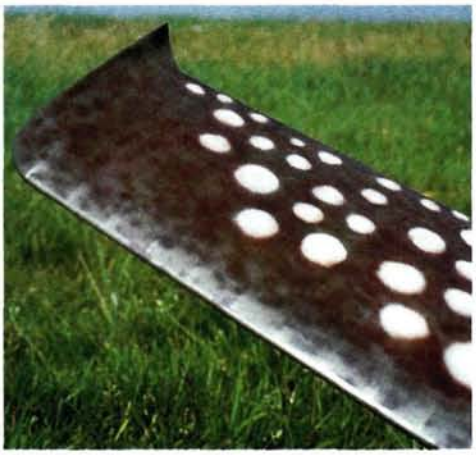
Left: plenty of room for radio and servo installation. Right: here's a belly view showing the painted-on gills and finger pockets for hand-launching. Note the aluminum towhook in the background.

balance the model. The pack was split into two, 2-cell packs to allow placement in the very front of the model. The radio switch is underneath a hatch that is opened before and after each flight. Two standard servos can be used to operate this model; there is no need to use miniature radio gear in this bird!

V-Stingray

FSP1002A

This unusual-looking, lightly loaded glider is a real eye-opener that was inspired by the sea-dwelling stingray. Designed to maximize the fuselage's lifting surface, the model uses traditional wood and plywood construction and incorporates carbon-fiber tubes for use as the tail boom and wing spars. It has plug-in wing panels for easy storage and transportation. WS: 92.25 in.; L: 44.5 in.; radio: 2-channel (with V-tail mixing); 1 sheet. $19.95.

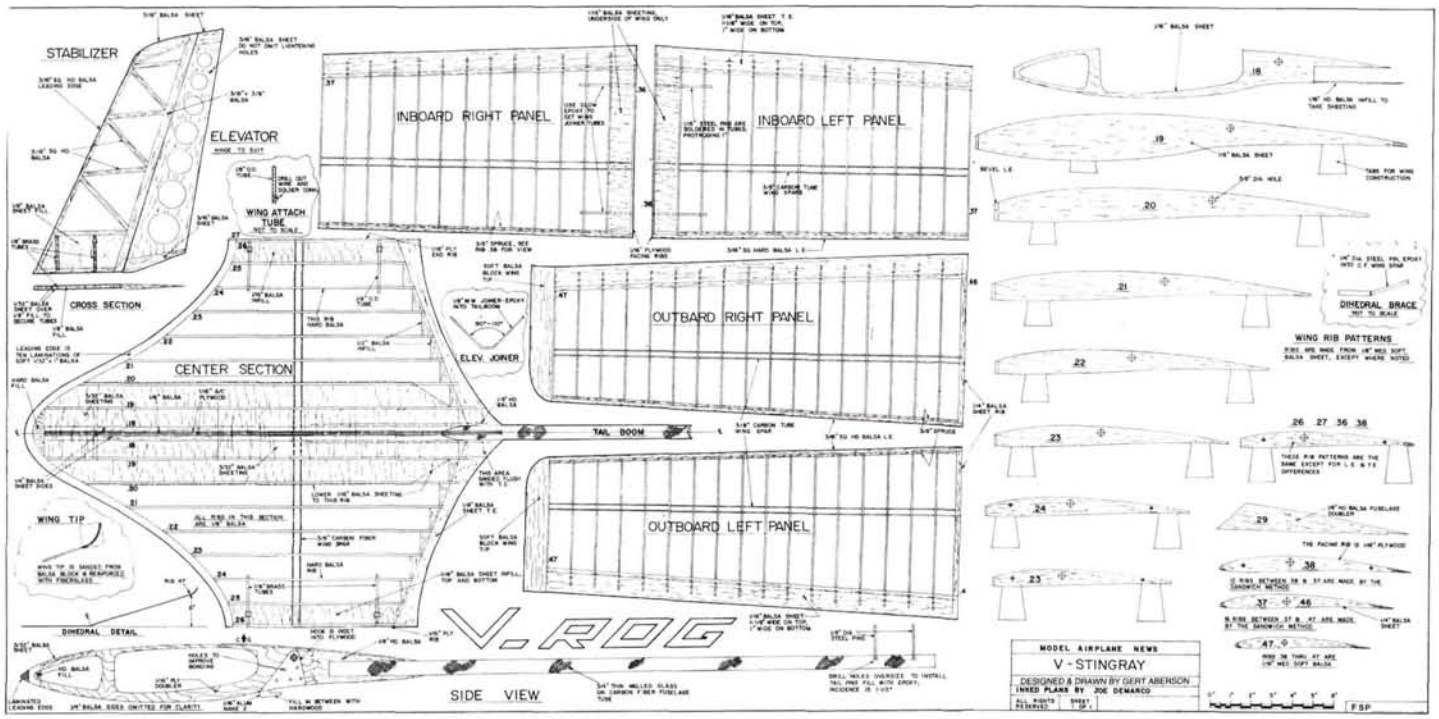


The wingtips are made of balsa blocks sanded to shape and reinforced with ½-ounce fiberglass cloth.

PAINTING AND FINISHING

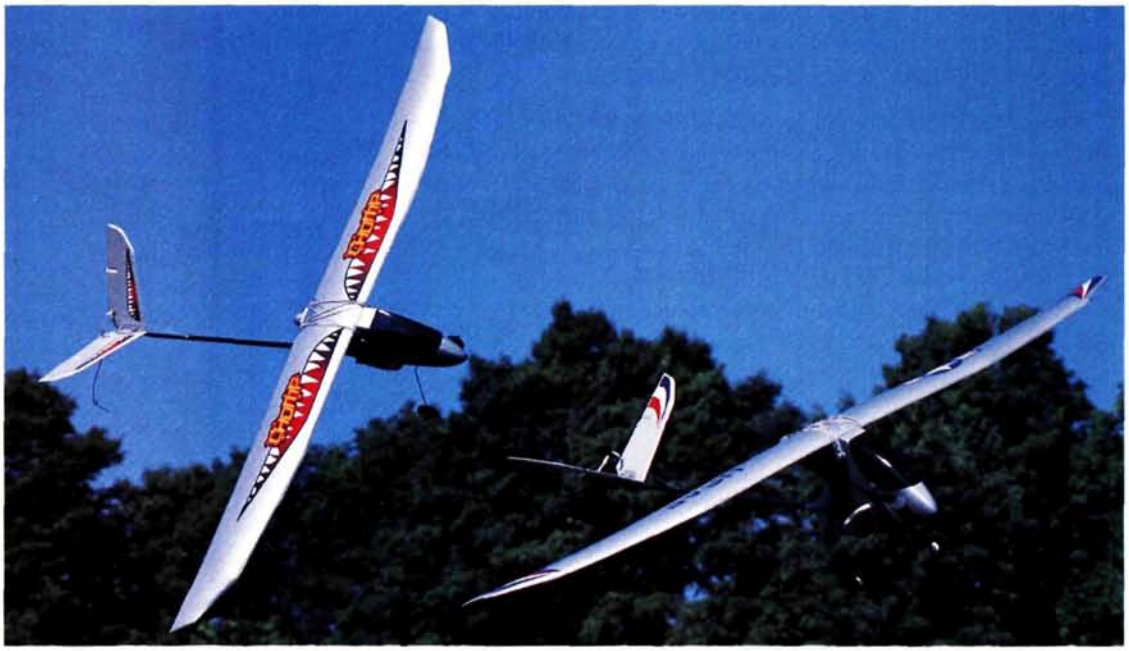
The model was covered with pearl white Oracover on the undersurfaces and olive drab on the upper surfaces; then it was spray-painted to resemble a real stingray. The patterns on the upper surfaces were sprayed white; paper templates of various diameters were used for the circles. After the paint had dried, a mixture of brown and tangerine paint was sparingly applied by hand all around the outlines of the circles with an airbrush to soften the edges. The under-surfaces were sprayed with olive drab in a typical stingray pattern. The effect is most realistic, as can be seen in the photographs. When flying in gray sky conditions, the V-Stingray is quite agile, but care must be taken not to allow the model to fly out of sight. Like the real thing, this "fish" has great camouflage!

Oracover; distributed by Hobby Lobby (615) 373-1444; hobby-lobby.com.



To order the full-size plan, turn to "RC Store.com" on page 152.

RC combat for the 21st century



RC air-to-air combat is not a new idea; guys have been dogfighting with glow-powered planes towing ribbon tails at organized events for years. It is exciting to compete and to watch, but the planes themselves are fairly conventional, and the skill level required to fly them is beyond many modelers' capabilities. But thanks to the people at Horizon, the technology of RC combat just got a healthy shove into the modern age of high-tech backyard electrics. This modern equipment brings with it a new level of convenience and accessibility for novices. The HobbyZone Fighterbird is the plane that makes this possible, and we had a blast wringing out a couple of them at our local ball field.

The Fighterbird's basic platform should be familiar to you if you're at all interested in backyard electrics (and if you're reading this column, you'd better be!). The Fighterbird is essentially a Firebird XL—the biggest of Horizon's 2-channel V-tails—with a few aerodynamic updates to the wing and tail (similar to the modifications that turned the original Firebird into the Firebird II). But the thing that really transforms the Fighterbird into an air-to-air brawler is the addition of an underbelly-mounted combat module that sends and receives "hits" from an identical unit on your opponent's aircraft.

THE BASICS

Two-channel V-tails such as the Fighterbird are pretty simple; there's a stick for rudder and a stick for throttle. More throttle makes the plane climb, so this doubles as your elevator control. The Fighterbird sports a more aggressive wing profile (similar to the Speed Wing that's available for the Firebird II), so it's slightly more demanding than previous versions. You'll want to have some stick time on a 2-channel V-tail before you take on the Fighter.

WHAT TO EXPECT

The Fighterbird flies much like its predecessors, only more so. What I mean is that the 2-channel V-tail characteristics are slightly amplified. The wing makes it marginally more maneuverable, and the climb angle is a bit steeper. This new wing is sleeker, and my impression is that it produces slightly less lift. The only place it is noticeable is in the glide angle; off-throttle, the Fighterbird loses altitude faster than its stablemates.

For your first sortie, I suggest removing the landing gear and combat module so you'll get a better feel for the plane in the air. The smooth, tough plastic fuselage material will handle slide-in landings on grass all day, but the wire gear and smallish wheels (they're maybe 1 inch in diameter) can be tripped up by uneven surfaces.

Another worthwhile precaution is to put a couple of pieces of packing tape (or similar material) on the top and bottom of the wing's trailing edge for the first 3 or 4 inches on both sides of the prop. The Fighterbird is a tough little airframe, but the prop has a tendency to strike the trailing edge as the wing shifts in a crash. Tape should prevent the prop from chewing up the foam wing quite so badly. You can also use this tape as patching material after the fact, but I prefer to take preventive measures. I also suggest strapping down the wing with as many rubber bands as you can stand; the more firmly the wing is secured, the less likely it is to shift into the path of the prop.

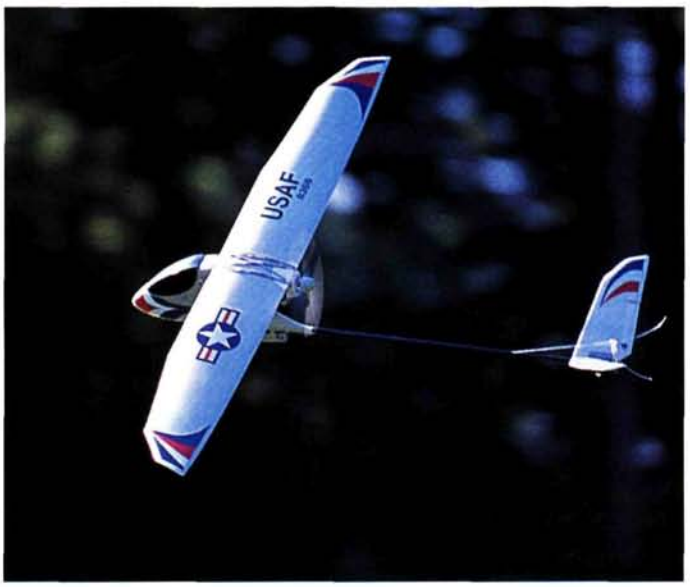
SPECIFICATIONS

MODEL: Fighterbird
MANUFACTURER: HobbyZone
DISTRIBUTOR: Horizon Hobby Inc.
WINGSPAN: 42 in.
NO. OF CHANNELS: 2 (throttle and V-tail mixing)
BATTERY USED: 6-cell, 900mAh NiMH
DURATION: 9 to 12 min.
PRICE: $149.99

The shark's-tooth decal notwithstanding, the combat pod is really what gives the Fighterbird its teeth. With it, you sonically register hits against your opponent.

LOCK AND LOAD!

An RC airplane with a weapons pod—how cool is that!? RC combat guys have been practicing a low-tech version of the idea for years using ribbons, and many have rigged bomb-drops from their planes. But until now, there has been no way to simulate one plane's firing a projectile at another. The system is pretty simple: the pod clips onto the bottom of the fuselage, and a 4-pin connector plugs into a port in the plane's side. At the front is a sonic pulse emitter (think of a tiny, high-frequency speaker); at the rear is a sonic pulse receiver (basically a high-frequency microphone); and on the bottom is a speaker that lets the pilot know what's going on by sounding two tones. A short, stuttering beep indicates that you are firing your "gun"; a long, high-pitched squeal indicates that you've been hit.



Above: the Fighterbird flies much like Horizon's other 2-channel V-tails, with one stick to control rudder and the other to control throttle, which also serves as elevator. The wing profile is more aggressive, so the Fighterbird is more nimble than previous Firebirds. Left: fighterbirds are strong enough to survive midair collisions!

The connector provides power to the module from the Fighterbird's 6-cell, 900mAh NiMH, but it also provides feedback to the plane's ESC. This last detail is what makes the combat module much more realistic and really raises the stakes for the pilot. You see, not only does the unit sound when hit, but it also cuts power to your motor for several seconds. As a nod to safety, you retain rudder control while the tone sounds and your throttle is cut, but don't underestimate the effect of suddenly being deprived of thrust! These planes rely on throttle both for airspeed and elevator control; if you take a hit, you will have your hands full until your throttle comes back. My informal tests showed the average cut time to be around 8 seconds; but when you're in a pitched battle, it feels like 8 minutes.

POST-MISSION REPORT

The Fighterbird is a truly innovative approach to RC combat, and it opens up that aspect of the hobby to a whole new audience. Novices will really benefit from the predictable handling, but they should have at least a little experience with 2-channel V-tails before taking on the Fighterbird. The new wing definitely produces sharper response, though experienced pilots might wish for a bit more maneuverability. The combat pod system works well, and the combination of range and angle required for a hit ensures that pilots won't give up because it's too easy. So grab a couple of Fighterbirds, and go see who wins air superiority in your neighborhood.

HobbyZone; *distributed by Horizon Hobby Inc. (800) 338-4639; horizonhobby.com.*

AT MODEL AIRPLANE NEWS, we not only tell you what's new, but we also try it out first so we can bring you mini-reviews of the stuff we like best. We're constantly being sent the latest support equipment manufacturers have to offer. If we think a product is good—something special that will make your modeling experiences a little easier or just plain more fun—we'll let you know here. From retracts and hinges to glow starters and videotapes, look for it in "Product Watch."

GWS
MC2002 Charger
Multi-use unit

Grand Wing Servo (GWS) has added an inexpensive and flexible battery charger to its ever expanding product line. Designed for NiMH and Ni-Cd packs of from 4 to 12 cells and with an adjustable charge rate of from 0.25 to 6 amps, this unit is suitable for a wide variety of electric-power batteries. I can use it to charge the batteries for every plane I fly, from the 7-cell, 300mAh NiMH packs I use in my Tiger Moth up to the 10-cell, 3000mAh NiMH packs and 2400mAh Ni-Cd packs that I use in my Jeti Phasor-powered Sig Kadet LT-25. I can also use it to charge my transmitter battery and the AA-size NiMH cells that power my digital camera. And it costs less than $50!

The charger has a large heat sink on its back, and on its face is a 0 to 6A meter, a current-adjusting knob and a switch for selecting between two cell-count ranges (4 to 8 and 6 to 12), and two LEDs marked "Trickle" and "Fast." Power input is via a lead of a reasonable size that ends in a pair of small alligator clips that you clamp to the supply battery. Output is via a pair of spring terminals such as those commonly found on stereo speakers. Output leads ending in bare or tinned wire ends are easily connected to these terminals. It also comes with JST, Tamiya and Futaba-J leads. Plugged into the left side of the charger case is a 20A, automotive-type input fuse.

Operating the MC2002 is extremely simple; just hook it up to a 12V power source (the charger operates on 9 to 15 volts DC). The red "Fast" LED will flash a few times, indicating that the charger is going through its power-up self-check. Select the cell-count range that's appropriate for the pack you want to charge, and turn the current-adjust knob to the left. After you've connected the pack, the red LED will light and, 6 seconds later, the fast charge will actually start. At this point, adjust the knob to set the desired charge current. When the battery has reached its peak, the red LED will go out and the green "Trickle" LED will light. The charger remains in the trickle mode until you disconnect the battery you were charging. That's all there is to it.

The trickle mode of the MC2002 is unusual. Instead of a steady but reduced current, it puts the full selected charge rate into the battery for about 2 seconds every minute, effectively giving a trickle charge of 1/30 the selected charge current. For example, if you have set it to charge a pack at 1 amp, it puts a 2-second burst at 1 amp into the battery every minute. I have found that this keeps the battery just slightly warm for an indefinite period.

The peak detection is sensitive enough for NiMH batteries, and when charging the batteries at 1.5C rates, I find that 300mAh to 3000mAh NiMH cells are warm but not hot when the unit ends the fast charge. Speaking of 1.5C charge rates, this charger has a 45-minute time-out on fast-charging, so you must charge at about 1.5C or higher for the battery to be fully charged before the safety time-out kicks in—disappointing if you want to be really conservative and charge your NiMH packs at 1C or less.

Another minor quibble is that the meter's 0 to 6A scale makes it a little difficult to precisely set the low charge rates that are suitable for slow- and park-flyer-type batteries. The gradations are in 0.2A increments, so setting the charger for 0.3 versus 0.5 amp is a matter of only one line on the scale. But for me, having a wide range of available output current overrides this concern.

The MC2002 is easy to use and flexible, and it's very attractively priced. It can handle a wide range of cell counts and capacities; you can use it to charge batteries for park flyers and also for 400W, 12-cell airplanes. I like mine so well that I got a second one to keep in my pickup so I'll be able to take better advantage of impromptu flying opportunities. Take a look; you'll be glad you did.

—Bernard Cawley Jr.

GWS; distributed by Horizon Hobby Distributors (800) 338-4639; horizonhobby.com.

Wing Tote Inc.

Wing Tote

Protect your wings

How many times have you arrived at the flying field only to discover that the wing of your favorite airplane has been bruised, scratched, or even worse—punctured? Well, Wing Tote Inc. may have just the product you need: customized bags to carry RC plane wings. Made of a durable outer nylon shell, ½-inch closed-cell foam padding and a heavy fleece lining, these zippered bags offer superior protection for wing surfaces during transportation to and from the flying field.

They feature 1½-inch nylon shoulder handles and convenient nylon tabs on three sides for vertical or horizontal storage using a simple wall-mounted hook. Single wing bags come in three sizes: the 64x20-inch Little Tote, the 74x20-inch Medium Tote and the 82x24-inch Big Tote. The double-wing bag, or Double Tote, measures 42x22x14 inches and is intended for large "plug-in-type" wings. Wing Tote also offers a Heli Tote helicopter bag. The bags sell for $100 to $150 and come with a 3-year limited warranty.

Never again will you have to worry about that expensive plane wing in the back of your car or truck. —*Jim Onorato*

Wing Tote Inc. (425) 251-5241; wingtote.com.

"Wedell-Williams Air Service"

Written by Robert S. Hirsch and Barbara H. Schultz, this 120-page publication is a great read filled with a wonderful collection of facts, figures, photos and drawings pertaining to the famous James R. Wedell and Harry P. Williams aviation team.

The Wedell-Williams Air Service began building its first racer in 1929 and went on to become a famous aviation icon. If you aren't familiar with the company's name, Wedell-Williams was an influential commercial aviation business, and the company dominated air racing in the 1930s. Unlimited-class Wedell-Williams race planes won the famous Thompson and Bendix Trophy Races 14 times and set numerous land-plane speed records. The book is a treasure of information about this famous air racing team, and I thoroughly enjoyed reading it.

Covering the company's involvement in the National Air Races from 1930 to 1939, the book offers 159 black-and-white photos, 19 multi-view scale aircraft drawings and several hand-drawn illustrations. Other famous personalities from the Golden Age of air racing are also mentioned. Race pilots such as Jimmy Doolittle, Roscoe Turner, Reggie Robbins, Stan Stanton, Joe Mackey and Mary Haizlip add much to the flavor of the Wedell-Williams racing story. Famous race planes, as well, come to light as you turn the pages and read about the various incidents that this successful team encountered. From their first race plane—the "We-Will," an 80hp Hispano-Suiza-engine-powered, low-wing design—to the famous and powerful Gilmore Red Lion, several race planes are highlighted.

Whether you are interested in the Golden Age of air racing or are just looking for an addition to your little-known-aviation-facts library, "Wedell-Williams Air Service" is worth your attention. I highly recommend this book.

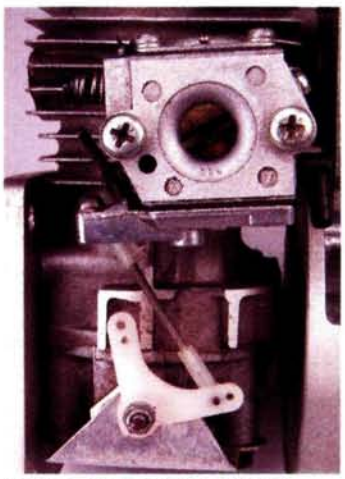
—Gerry Yarrish

Published by Little Buttes Publishing Co.; $19.95 (plus $2 S&H); distributor: Raceplanes by Hirsch; (714) 828 7369.

Easy engine mods

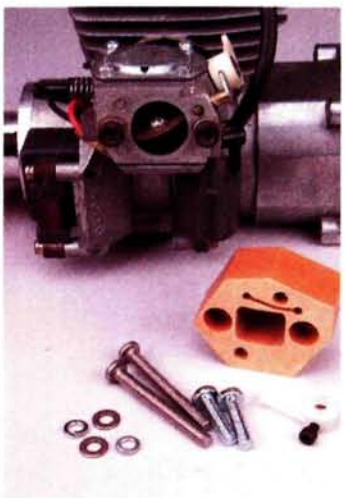
A common problem that most giant-scalers face is fabricating and installing custom throttle linkages for our gasoline-powered engines. Most popular RC airplane engines are derived from commercial-use engines, and their carb installations require a change in pushrod direction to properly open and close the butterfly valve. This can be done by using either a bellcrank or a flexible pushrod, but the changeover is usually a rather complex task. Zenoah recognized this problem and has come out with a handy little adapter block that is simply bolted under the carb to reposition it so a simple, straight linkage can be used. Hurray!

Available for the G-23, G-38, G-45 and G-62 Zenoah engines, these adapter blocks are made of a heat-resistant phenolic plastic and have threaded brass inserts for the carb-attachment bolts. You simply attach the block to your engine with the included bolts (they go in the counterbored holes) and then bolt your carb to the block. An air passage has been milled into the block so the carb still receives the pulse pressure to operate the diaphragm pump. After the block is in place, remove the stock throttle arm and replace it with the nylon arm that comes with the block. Zenoah recommends that you use a ball-link clevis to connect the arm to the pushrod to correct any minor misalignment.



Here's a typical throttle-linkage setup on a G-38. It works, but it's cumbersome.

Here you see the carb and adapter block attached to a G-62. Note the position of the throttle arm.

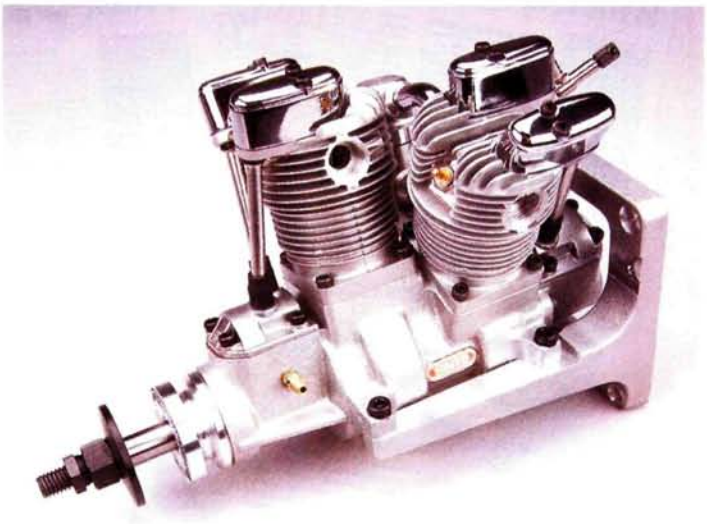


These new Zenoah carburetor-adapter blocks reposition the engine's carb so you can use a straight pushrod—no more complicated linkages. Note the air passage milled into the block; this keeps the pulse pressure feeding the carb.

Priced from $11.39 to $12.29, the new Zenoah carb-adapter blocks work very well, save a lot of effort and help to simplify your model by eliminating complicated throttle linkages. Try one on your next Zenoah-powered model.

SAITO 200TI

When I first saw the new Saito 200Ti in-line twin, I knew it would be an impressive performer. A specialized producer of 4-strokes for many decades, Saito builds some of the best 4-stroke engines available. I have owned and operated several of their single- and multi-cylinder powerplants, and all have had an outstanding power-to-weight ratio. Not exactly a true in-line twin and not exactly a true V-twin, the new 200Ti encompasses the best of both worlds. Because they're offset, the cylinders are positioned a little more closely together than those in a standard front-and-back, in-line layout, and its V-angle is much less than that of a typical V-block engine. I describe it as having a unique offset, in-line cylinder layout. After one look, you will appreciate the engine's narrow dimensions; they make it a perfect choice for Mustangs, Messerschmitts, Spitfires and other narrow-nose warbirds. With a displacement of 2ci, the 200Ti has just the right oomph to power a typical 1.20-size aircraft. Outfitted with its own engine mount and a single carburetor intake design, the 200Ti should be a breeze to adjust and operate. I can't wait to slap this one on the test bench! I'll share my findings with you in a future column.



The newest Saito 4-stroke engine: the 200Ti. This impressive engine comes with its own mount.

SPECIFICATIONS

Engine model: Saito 200Ti
Type: offset, in-line, twin-cylinder engine
Bore: 28.2mm
Stroke: 26.4mm
Displacement: 32.98cc
Weight: 1.46kg (without mufflers)
Recommended prop: 16x8
Price: $749.99

BIG SOUNDMASTER MUFFLERS

Besides being the guru of diesel conversions for model airplane engines, our good friend Bob Davis of Davis Model Products also produces an excellent line of mufflers. Bob recently sent me one of

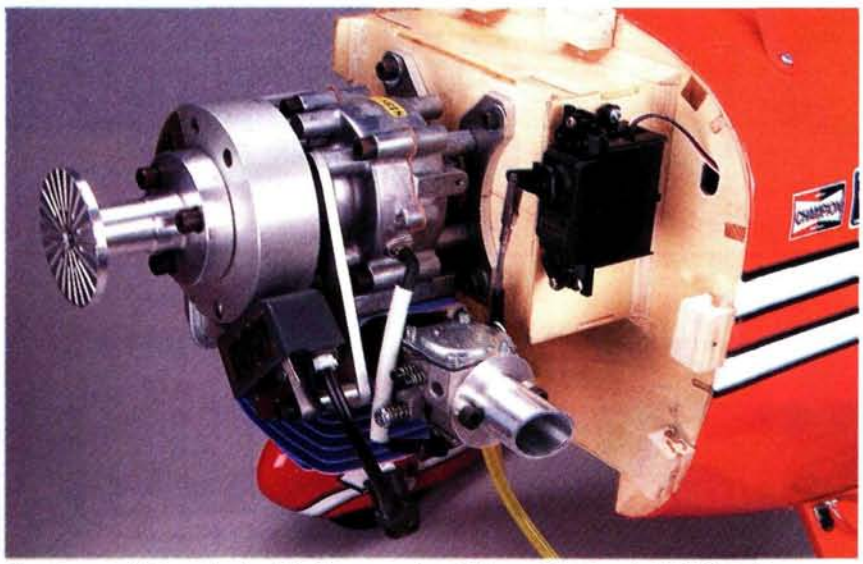
Specially designed for big engines, the new Powermaster muffler from Davis Model Products is a very effective exhaust silencer.

his newest large-capacity silencers that's specially designed for big engines. Measuring 4¾ inches wide and 2 inches in diameter, the newest Soundmaster muffler is made with a brass-alloy body and comes with an internal baffle. An aluminum adapter that you can easily fit to your engine is also available. Simply drill two holes in the adapter to match your engine's exhaust port, and screw it into place. Insert the muffler's ⅞-inch-diameter inlet pipe in the adapter and rotate the muffler to the desired position. Drill a hole through the inlet pipe and adapter and secure it with an 8-32 bolt, washer and locknut. The mufflers come with an attractive black-painted finish, and each has a flared pressure tap that could also be used as a smoke fluid inlet.

I installed the muffler on my G-23, and I have to tell you: it really quiets the bark of my old Zenoah gas engine. The muffler is also compact enough to be installed in a scale model. Simply attach the muffler to the firewall with two metal straps and then connect it to the adapter with a bendable metal exhaust tube and clamps. This new, American-made muffler is priced at less than $60 (not including the adapter), and it's just what the doctor ordered if you care about noise reduction!

GREAT PLANES PITTS UPDATE

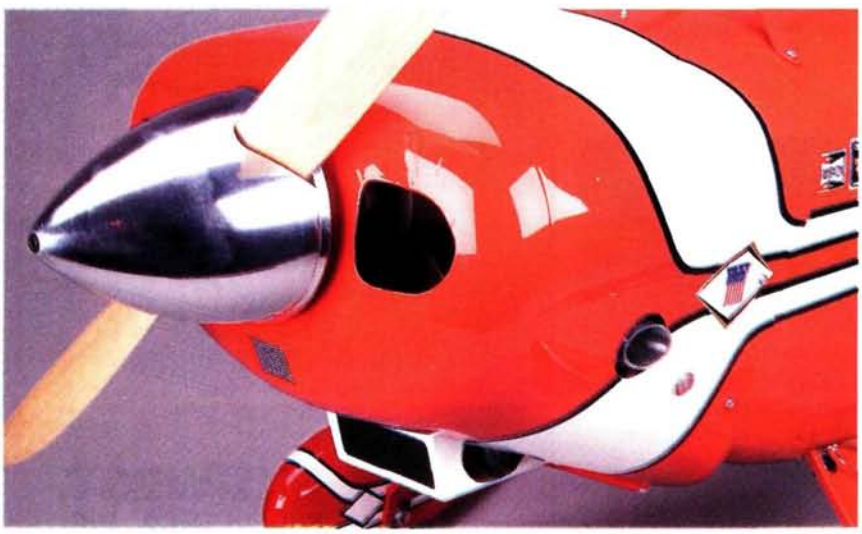
A couple of issues ago, I highlighted my new ⅓-scale Pitts ARF from Great Planes. My model is now powered by a Fuji 50cc gasoline engine. The Pitts was originally designed for a large glow engine such as the O.S. 1.60, but converting it to a gas engine is very easy. The Fuji 50's drive shaft sticks out of the rear case, so you have to drill a 1-inch clearance hole in the center of the firewall. After that, simply attach the engine to the firewall with four attachment bolts. The easiest way to do this is to make a paper template of the engine mount and transfer the location of the holes to the firewall. Install four 10-32 blind nuts, and bolt the engine into place—very simple. The distance from the firewall to the spinner's backplate is 6 inches, so you need to install a longer prop adapter (available from Great Planes) on the Fuji engine.



Here's my Fuji 50 engine installation on my Great Planes Pitts Special ARF. Note the servo installation on the side of the firewall box.

To make the throttle linkage, I attached the throttle servo to the side of the firewall box with a molded-plastic aileron-mounting case and installed a short, straight pushrod. Both the servo and the mounting case are equipped with rubber grommets, so vibration (with a balanced prop) should not be an issue. I used a Rocket City ball-link clevis (now available from Nelson Hobby Specialties) to connect the pushrod to the stock throttle arm.

I also added a Zenoah velocity stack to the Fuji 50's carb. The engine comes with a flat choke plate that slides over the carb opening. Choke plates require a pushrod and a return spring to function properly, and I did not want to make and install all the additional linkage. The velocity stack fits perfectly and is bolted into place without modification with standard 8-32 bolts. The velocity stack brings the carb opening out of the engine cowl for better "breathing"; all I have to do to choke the engine is stick my finger in it and flip the prop. Couldn't be simpler!



The Zenoah velocity stack is installed in place of the stock choke plate. To choke the engine, I simply stick my finger in it and flip the prop.

Ready to fly, the Pitts weighs 17 pounds, 1 ounce, and has a wing loading of about 30.2 ounces per square foot. I don't want to spoil the upcoming review, but I can tell you that this is a great engine/airplane combination!

Until next time—fly safe!

Davis Model Products; *(203) 877-1670.*
Fuji; *distributed by Great Planes.*
Great Planes Model Distributors *(800) 682-8948; greatplanes.com.*
Horizon Hobby *(800) 338-4639; horizonhobby.com.*
Nelson Hobby Specialties *(877) 263-5766; nelsonhobby.com.*
Saito; *distributed by Horizon Hobby.*
Zenoah; *distributed by Horizon Hobby.*

NAME THAT PLANE

Can you identify this aircraft?

SEND YOUR ANSWER to *Model Airplane News*, **Name that Plane Contest** (state issue in which plane appeared), 100 East Ridge, Ridgefield, CT 06877-4606 USA.

William Weiss of Meridian, ID, won August's "Name that Plane" contest by correctly identifying the mystery plane as the Boeing XB-15. Congratulations, William! Affectionately referred to as "Old Grandpappy," this 149-foot-wingspan, long-range bomber was the forerunner of the now famous B-17 Flying Fortress and B-29 Super Fortress. At the time of its maiden flight in 1937, it was considered to be the largest plane ever built. Unfortunately, the power of four Pratt & Whitney Twin Wasp radial engines proved insufficient, and the prototype pictured here was also the *only* one ever built. The XB-15 had a top speed of 200mph and was capable of carrying an enormous payload. During WW II, it saw service as a cargo carrier for the U.S. Army Air Corps under the designation XC-105. Though several attempts were made to redesign the aircraft with more powerful engines, the project was eventually cancelled and the aircraft was scrapped at the end of the War.

The winner will be chosen, four weeks following publication, from correct answers received (delivered by U.S. mail) and will be awarded a free, one-year subscription to *Model Airplane News*. If already a subscriber, the winner will be given a free, one-year subscription extension.

MODEL AIRPLANE NEWS

CLASSIFIEDS

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BUSINESS

FOR SALE: scale plans for a 57-in.-wingspan Westland Lysander. Must structurally build it to suit your needs. For use with high-powered or heavy engines. Plan comes in 29 sections. Approximately 12x3 feet. Price: $120 in U.S. funds only. Mail and make checks payable to: Lee R.T. Frick, P.O. Box 2201, Murrells Inlet, SC 29576. Please allow 30 to 60 days for delivery. [12/02]

NEW TOP GUN onboard ignition system to start your RC glow-plug engines faster, easier and safer. See www.eaglehobbies.com; (435) 477-1503. [12/03]

GUARANTEED: the best copies and enlargements—low prices—black ink on large sheets—no fuzzy blue-lines, no dozens of sheets taped together—any size or scale from plans or magazines. Build from a copy and save your valuable plans. $2 for info and customized poster for your shop. Roland Friestad, 2211B 155th St., Cameron, IL 61423. [3/03]

RC CUSTOM BUILDERS INC. Over 30 years experience. Specializing in RC aircraft including sailplanes and helicopters. We will custom build for you, frame up, covered or with radio and motor installed. We will even test-fly it for you at no extra charge. We also build ARFs and offer flight camps and instruction all summer long from April to November. For more information, please contact Mark or Joe at (970) 887-3698 or www.rccustombuilders.com. [10/02]

MODEL AIRPLANE NEWS 1952-1980; "Air Trails" 1937-1952, "Young Men" 1952-1956, "American Modeler" 1957-1967, "American Aircraft Modeler" 1968-1975. $1 for list. George Reith, 3597 Arbutus Dr. N., Cobble Hill, BC, Canada V0R1L1. [4/03]

WARPLANE WINDVANE PLANS! Build amazing scale windvanes! Details: Windm, 520 Hooper Rd., 153, Endwell, NY 13760-1960;www.windm.com. [10/02]

BOB'S AIRCRAFT DOCUMENTATION 2002. World's largest commercial collection of aircraft photos (400,000) and 3-view line drawings (35,000). 256-page catalog, $8 (Canada, Mexico, Alaska, Hawaii, Puerto Rico—$10; foreign, $18; includes postage). 3114 Yukon Ave., Costa Mesa, CA 92626 USA; (714) 979-8058. [12/02]

RC FLIGHT TRAINING. Learn to take off and land in far western North Carolina, near Murphy. 1635 Settawig Rd., Brasstown, NC 28902; (828) 389-8968. [11/02]

www.telstarhobbies.com Crash videos! Your online source for RC and full-scale aviation books and videos. (772) 286-2535; sales@telstarhobbies.com. [5/03]

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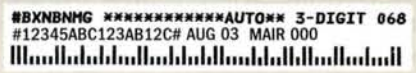

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BY GERRY YARRISH

Joe's fire-breathing Komet!

This impressive Me-163 is displayed by Joe Beshar and Lucas Vallejo. The Richthofen Red paint scheme is scale; it was the color of the aircraft flown during WW II by Commander Hauptmann Spatte.

Coming into operation just a bit too late in the War to make a difference, the stubby-looking, sweptwing Me-163 Komet was an impressive sight. Able to reach speeds of more than 590mph, the 163s would blast off in defense of their home bases and could effortlessly strafe and molest Allied bombers over Germany. Once their volatile fuel had been spent, they glided back to base to do it all again. On one such bombing raid late in the War, Joe Beshar—then a B-17 pilot and now a longtime *Model Airplane News* contributor—caught a glimpse of not just one but a pair of German rocket planes as they zipped though his bomber formation! They flew by so fast that none of the gunners could draw a bead on their attackers; they could only watch as the futuristic rocket planes zipped by! What a dramatic moment that must have been almost 60 years ago!

Joe (right) and Lucas Vallejo make last-minute adjustments to the turbine engine before the first flight.

Well, Joe made it through the War and has since become a well-known builder of impressive and unusual models. Joe has even built several scale RC models of the B-17 he was flying on the day when he spied those Komets! What could top that?

Still a prolific builder and model-warbird lover, Joe got the idea to build a ¼-scale model of an Me-163 Komet, and unlike anyone else, he chose to power his rocket plane with an AMT turbine engine. Many have been built with prop engines in their noses, and some have even had model rocket engines in their tails, but Joe's Komet is, as far as we can tell, the only such model in the U.S. that runs on Jet A! As I said, Joe is into the impressive and unusual!

Built from a set of Jim Kiehl plans, the 105-inch-span Komet has a built-up balsa and plywood construction and is entirely sheeted with balsa. The fuselage is finished with fiberglass cloth and resin and painted with acrylic enamel paint. The wings are covered with MonoKote, and the finished model's ready-to-fly weight, with 60 ounces of fuel on board, is 22.75 pounds. The "Richthofen Red" paint scheme represents the aircraft flown by Commander Hauptmann Spatte of the Luftwaffe's Test Command. Joe uses an Airtronics radio to control the rudder, throttle and elevons on his fire-breathing Komet.

Joe's Komet has thus far been flown only by his good friend Lucas Vallejo, and the photos in this article were taken at Floyd Bennett Field in New York state. The model's flight performance is most definitely scale, and the takeoff even uses a drop-away launch dolly. Joe's story is unique: he has seen firsthand full-size Komets with bullets flying, and he has lived to build a state-of-the-art model Me-163 Komet. Some guys have all the luck!

Up, up and away! Flown by Lucas Vallejo, Joe Beshar's turbine-powered Komet blasts off to defend Floyd Bennett Field!